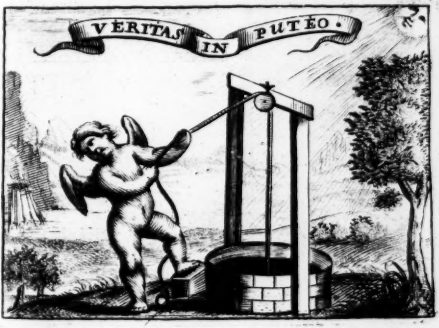
OBSERVATIONS
On the
Mineral WATERS
OF
FRANCE,
Made in the
ROYAL ACADEMY
Of the
SCIENCES,

By the Sieur DU CLOS, *Physician in Ordinary to His Most Christian Majesty.*

Now made *English.*



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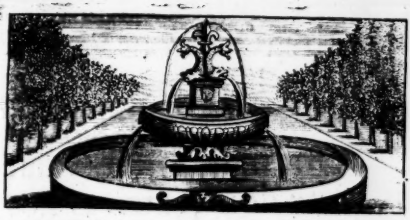

THis Treatiſe being the Product of that Ingenious Aſſembly, the *French* Royal Academy of the Sciences; and Curious both in Subject and Method, has been thought not unworthy to ſpeak the *Engliſh* Tongue.

It may be hop'd, that Our Nation, which is ſo good Natur'd, as to imitate, ſometimes even the Follies of thoſe our Neighbours, may hence be excited

cited by a Generous Emulation, to a like, if not greater Performance in this kind.

Some may object, what is Here done, arrives not to the Exactneſs of Certain Knowledge; which tho granted, hinders not, but ſuch a numerous Collection of faithful Experiments may find a favourable acceptance.

The Subject Matter lies Dark and Deep, in the very Bowels of our Mother Earth; and the Great Chain of Cauſes and Effects is perfectly known, only to that All-Wiſe Being, whereon it depends.

O B-

OBSERVATIONS
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THe Uſe of Mineral Waters having deſervedly obtain'd a great Eſteem and Reputation for the Cure of many Chronical and Rebellious Diſeaſes; ſome Phyſicians have applied themſelves

ſelves to ſearch out, by Experiment, their Nature and Principles; thereby to judge how far they are proper for certain Diſeaſes, and the particular Conſtitution of the Diſeaſed: While others have been contented to refer themſelves to common Opinions founded on the Obſervations of ſome Effects.

This Matter being ſubordinate to Phyſical Speculation, the Royal Academy of the Sciences have determined to employ themſelves in the Enquiry of the Qualities of thoſe in this Kingdom, which are moſt conſiderable. And till favourable occaſion may offer to make Obſervations at their Springs, they have cauſed theſe Waters to be brought from ſeveral Provinces, with much care, to examine them in the uſual Aſſemblies of the Naturaliſts of this Academy.

The Reſolution to proceed herein has not been taken without much conſideration; the Reaſons from the advantage of theſe Waters for the reſtoring Health in many Diſeaſes, being counterbalanced by thoſe of the Difficulty in knowing the Cauſes of their Propri-

Proprieties, which depend particularly upon the Mixtures of certain Subſtances which meet together in their Paſſages in the Earth, or in the Cavities and Interſtices of Rocks, which are various and many, as Vapours, Juices, Salts, Earths, *&c.*

The greateſt part of theſe ſubſtances, wherewith Mineral VVaters are impregnated, cannot be diſcern'd; and the different Mixture which is made of ſeveral together, may conſtitute ſo great a Number of Kinds of Mineral Waters, wholſom or unwholſom, that it is impoſſible to give any knowledge or determination of them all. The Waters of the ſame Springs may, at divers times, receive conſiderable Alterations, either by new Mixtures, or by the Ceſſation of thoſe which have been formerly made.

It is not probable that theſe Waters, called Mineral, ſhould be produced alone by Mineral Vapours condens'd, or that there is in the Earth Mines ſufficiently abounding to furniſh continually Vapours capable, being condens'd, to maintain a perpetual Courſe of theſe

Waters in Springs which dry not. But it may be that ſome Mineral Vapours or Exhalations do mix with common VVaters, which traverſe the Earths where they meet and are condens'd, and that theſe VVaters are impregnated with their Qualities, and of ſome other Volatile Salts not Concrete, elevated in theſe dry Exhalations or humid Vapours. The diſtinguiſhing the Qualities of theſe Exhalations and Vapours is not eaſy; the Diverſity of their Principles is very great; the Rencounter of their Mixtures is caſual; the Conditions of the Places thro which they paſs, and wherein they are retained, are not evident; and the Alterations which they produce in the Waters wherein they inſinuate themſelves, are not always very manifeſt.

There is no leſs difficulty to know and diſtinguiſh the Juices which are mixt with Mineral Waters, and particularly thoſe which receive nothing of Concretion, and which communicate to theſe Waters no ſenſible Quality; for theſe liquid Juices, and wholly Volatile, paſs in diſtillation with the ſubſtance of the

the Water, and are no otherwiſe manifeſt than by Effects which ſimple Water cannot produce.

The Juices, which are call'd Concrete, becauſe they are Condenſable and Reſoluble, leave Sediments which render them viſible and palpable after the Diſtillation or Evaporation of the Water wherewith they are mixt. But it is difficult to diſcern their Kinds and Proprieties, if they have no reſemblance to thoſe which are already known, or if they are many conjoin'd.

The Salts and Earths are the moſt ſenſible and moſt common ſubſtances which mix with the Waters of Springs and Wells. There is almoſt no ſort of Earth which participates not of ſome Salt diſſoluble in the Waters which paſs thro it; and the Current of theſe Waters carries away always ſome fine Earth. This is found the moſt manifeſt in theſe Waters: But the knowledg of theſe Salts and Earths mixt in theſe Waters, is not always ſo diſtinct as to determine their Species, and make a certain judgment of their Properties.

There are few Concrete Salts known to us: There may be many which have no resemblance with Common Salt, Nitre, Alum or Vitriol, which are the four most common Genders of Concrete Mineral Salts. Those whose disposition towards Concretion is not yet compleated, and which are yet in *Embryo* or their first Seminal Being, are less distinguishable in that State: And those which are more formed, and either already Concrete, or capable of Concretion, by some called Enix, that is to say, born and come forth out of their Matrixes, have not substances Simple and Homogeneous in each kind.

The Salt which goeth under the Name of Common Salt, contains two different Parts mixt together; whereof one is Condens'd and Chrystalliz'd, thro Cold in a Humid, after Evaporation of one part of the Water, wherein this Salt hath been dissolv'd; the other is not Chrystalliz'd or Condens'd, but by a total Evaporation of the remaining Water. The former Part is most Sulphurous, and by its Sulphureity

mixeth

mixeth with the Sulphurous Salt of Tartar Calcin'd and Diſſolv'd by the Moiſture of the Air, or in common Water, without trouble and without Coagulation: But the other Part containeth an Acidity which Coagulates in an inſtant the diſſolv'd Salt of Tartar, and all other fixt Salts, Sulphurous and Nitrous.

Vitriol, which ſhooteth forth by the Humid Air on Sulphurous Marchaſites, hath likewiſe a Succulent part, Condenſable only by a total Evaporation of its Aqueous Humidity, of a taſte very Acrimonious, of a conſiſtence Unctuous and eaſily diſſoluble by a humid Air, which Part is much different from that which firſt is Condenſed and Chryſtallized thro Cold in Water wherein this Vitriol hath been diſſolved. Theſe Chryſtals are Pure Acid-Auſtere Vitriol, whence there is precipitated much Mineral Earth by the mixture of Sulphurous and Nitrous Salts, with which the other Part can mix without trouble, having not, as the firſt, this Acidity whereon the Sulphurous Salts may act. The contrary whereof happens to Com-

mon Salt, whereof the firſt Part is the moſt Sulphurous, and the ſecond moſt Acid.

The true Nitres are likewiſe compos'd of two different Saline Parts; the one more Sulphurous, which is Chryſtalliz'd thro Cold in a Humid; the other, which remains diſſolv'd after this Chryſtallization, and which is not condens'd but by a Heat ſtrong enough to drive away all the Diſſolvent Humid, is leſs Sulphurous, and hath a certain Acidity which the other hath not.

The firſt Beings or Embryo's of Mineral Salts are nothing elſe but Vapours, or Juices Unconcrete, wholly Vapourable, whereof ſome may be Condens'd, and in part fixt by the force of Fire; or be diſengag'd from their Matrixes, and rendred capable of Concretion by the means of the Air; which is obſerv'd in certain Nitrous, Aluminous and Vitriolic Salts. The Sulphurous Salt which is found in the Calx of certain hard ſtones burnt in the Fire, and which is a kind of true Nitre, had its Seminary in theſe ſtones Crude; and in this ſtate of its firſt Being is much different

ferent from what it acquires by the Fire, which from being Cold and Coagulative rendreth it Cauſtic and Reſolutive. The Cold and Coagulative Quality of this ſtony Salt in its firſt Being is manifeſt enough in the Water of the Springs of ſome Rocks, which are very Clear and Cold, and which produce Gouts and Cold Scirrhous Tumours in thoſe who ordinarily drink of them. This Seminary of ſtony Salt is rendred Nitrous, Sulphurous, Cauſtic and Reſolutive by the Fire, which is able to exalt it, but not to produce it in the Calcination of theſe Stones, no more than in burnt Oyſter-ſhells, whereof is alſo made a Calx, which hath no leſs of a Sulphurous Salt. This Embryonate Salt in the Chalk-ſtones is a ſtony Juice, which mixeth it ſelf with Waters which paſs between the Beds and Interſtices of theſe Stones in the Rocks, but is not eaſily diſcern'd in the Waters impregnated therewith.

The Seminary of Alum and Vitriol is alſo neceſſarily in the ſubſtances whence theſe ſorts of Salts are drawn, by the means of Water, after their Cal-

cination in the Fire, and Maceration in the open Air. The Fire and the Air which are able to exalt them, cannot produce them. The Seminary of Alum in the Aluminous Stones, and that of Vitriol in Sulphurous Marchasites, are not in this state manifest to our senses; and oftentimes they are not known in Mineral Waters but by some Effects, and that without certainty, because these Effects may be Equivocal.

All these Diversities of Mineral Salts, Embryonate, Enix, Chrystalline, Succulent, Sulphurous, not Sulphurous, of the first and of the second Concretion; those also of their Genders, Species, Mixtures, Proportions, Alterations, *&c.* render the Judgment of the Proprieties of Waters partaking of them very difficult and uncertain.

The fine Earths which also are mixt in Mineral Waters may be of several Kinds difficult to be distinguished: they being of divers Colours; White, Grey, Yellowish, Ruddy, Brown, *&c.* and also of different Qualities. Some are dissoluble in distill'd Vinaigre, others indissoluble; some may be melted,

ted, others not, by Fire; wherein alſo they receive diverſe Colours: Some reſemble Marle, others Clay, others Chalk, others Bole, ſome Sand, others Talk, and others Calx; ſome are produc'd by the Concretion of certain Juices Saline or Sulphurous, others not; ſome ſimply Mineral, others Metallic. The moſt part of theſe Species being difficultly diſtinguiſh'd when ſingle, are much more when mixt.

The ſimple Infuſions of certain Mineral-Sulphurous Earths may remarkably alter the Waters of Wells and Springs, notwithſtanding there may remain no Sediment from theſe Earths after Diſtillation, as happens in Liquors rendred Emetic by the ſimple infuſion of Antimony.

The Hot Mineral Waters may contract ſome alteration by Sulphurous and Bituminous ſubſtances meeting in their Courſe; for theſe ſubſtances participate of certain ſubtil Salts, which theſe Waters may diſſolve and carry with them.

Some Mineral Waters, Cold or Tepid, have a Taſte ſomewhat Aigre, or

or Vinous, which is not obſerv'd in any of thoſe which are remarkably Hot; but this Taſte is ſo eaſily loſt by the leaſt Heat, and even by the Air, that it is difficult to know what produceth it. This is found not only in Waters eſteem'd Aluminous and Vitriolic, but alſo in thoſe which are manifeſtly Nitrous, and which abound in a Sulphurous Salt oppoſite to Acids.

The Cauſes of the Heat of certain Mineral Waters are little known. There is reaſon to doubt whether there be Subterraneous Fires capable of heating them, or whether they receive this Heat from the Exhalations of certain Mineral Juices Fermentable, or wherein there is cauſed an Effervescence by the mixture of other Juices.

All theſe Difficulties have hindered, theſe four years, the advantage which the Public might have receiv'd from the Communication of what the Naturaliſts of the Academy have been able to obſerve on Waters which have been ſent them from ſeveral Provinces; and which they have examined according to the opportunities which they have had. The

The Method which has been taken in this Enquiry was to obſerve,

1. From what Place they came.

2. In what Time and Diſpoſition of the Air they were taken from their Springs.

3. How long they had been put up in Bottles to be ſent away.

4. Whether they were preſerv'd in Bottles that were clean and well ſtopt.

5. Whether they had made any Sediment in the Bottles, and of what ſort.

6. Whether they were clear or muddy.

7. Whether they had any manifeſt Scent or Taſte.

8. Whether their Weight differ'd remarkably from that of ſimple and Common Waters.

9. Whether they took any Tincture or Colour by certain Powders, as of Galls, of Oak-leaves, Pomegranate-Bark, of Myrobalans, *&c.*

10. Whether having been expos'd to the Air, or a little warm'd, they would no more receive the Tincture or Colour.

11. Whe-

11. Whether being put to Distillation by an Alembic *in Balneo Mariæ*, there rose and distill'd first of all some Liquor more subtil than the rest; and whether there were found any difference between the several parts of the same distill'd Water taken apart.

12. Whether in Evaporating or Distilling these Waters by a gentle Heat, there were form'd any Films on the surface of the Water; or whether there were made some Earthy Concretions swimming in the Water in Flakes, or adhering to the sides of the Vessels, or settling to the bottom; and of what sort.

13. Whether after Distillation, or Evaporation, almost total, of these Waters, there was made, in the remaining Liquor set in a cold place, any Concretion Saline, Fibrous, Granous, Leafy, or otherwise figur'd.

14. Whether the Water being totally Evaporated, or Distill'd off to a driness, left a Sediment, how much, and of what sort.

15. Whether the Earthy Sediments contain'd any Portion of Salt, or not.

16. To

16. To what ſort of Salts commonly known, the Salts of theſe Waters might be referr'd.

17. Whether they caus'd Mercury ſublimate diſſolv'd in common Water to precipitate in a Red, ‡ deep Crimſon, or Yellow colour; and whether alſo they caus'd the Sulphurous Earth of common Vitriol to precipitate, as do the true Nitre of the Ancients, the Natron of *Egypt*, and foſſil Borax, and alſo the Alcaliſate or fixt Sulphurous Salts of Plants.

‡ *Nacarate.*

18. Whether they changed into Green the Colour of Syrup of Violets, and whether they reſtored the Blue colour of Tourneſole made Red by ſome Aluminous, Vitriolic or other Acid; as the true Nitres do.

19. Whether they made Tourneſole to become Red, as do Alum and Vitriol.

20. Whether they caus'd the Liquor of the fixt Salt of Tartar diſſolv'd, to thicken and coagulate quickly; as doth the Succulent and ſecond Part of Common Salt, which is not Condenſed but by a Total Evaporation of the Water wherein

wherein the Salt hath been dissolved.

21. VVhether they made any change in the VVater of the Dissolutions of Mercury Sublimate and Vitriol, or on the colours of Tournesole and Syrup of Violets, or on the Liquor of Salt of Tartar dissolv'd, any more than Salt-Petre doth, and the first Part of Common Salt which thro Cold Chrystallizes in a Humid.

22. VVhether the Earthy Sediments of these VVaters, after the Separation of their Salts, were wholly, or in part, Dissoluble in Vinaigre distill'd, and with a certain Effervescence, as do some sort of Chalks, and also the White Earth of the *Coagulum* of Nitrous and Alkali-Salts, produc'd by the Mixture of the second part of Common Salt.

23. Whether these Earthy Sediments, freed from their Salts, being put in the Fire, and strongly burnt in Crucibles, were fixt; whether they chang'd Colour, were Vitrified or Calcined; or by the means of Reductive Salts there might be drawn forth somewhat Metallic, or not.

24. Whether, if their Salts being pu-

purified, after having been melted by the Fire in Crucibles of good Vitrified Earth, they took any Colours extraordinary.

These Methods of examining Mineral Waters brought to the Academy, seem'd very reasonable to give some knowledge of the Properties of them; and even much greater than those who have hitherto writ on that Subject have ever had; who for the most part have grounded their judgment only upon their Effects, which may be referr'd to diverse Causes.

According to this Enquiry made upon a great number of Waters from different Springs, as well Hot as Cold, they have observ'd particularly Salts and Earths of divers Qualities, and different Quantities.

The Salts which have been Condensed after Distillation, or slow Evaporation, of the Waters which have been brought to the Academy, may be reduced to two Kinds; the one, to the Nitre of the Ancients, which is a Sulphurous-Mineral Salt, like to the Alkali of Plants; the other to Common Salt considered in one or other of its different parts, or ac-

according to the mixture of both toge ther. There hath not appeared in an of theſe Waters either Alum or true Vi triol.

The Waters, as well Hot as Tepid, wherein a Nitrous Salt was found, ar thoſe of *Bourbon l' Archambault*, *Neri Eſvahon*, *Mont d' Or*, *Chaudeſaigue Vichy*, *Vic le Comte*, *Martres de Veyr* and *Sail lez Chaſteau Morand.*

Cold Waters, wherein the true Ni tre hath been obſerved, are thoſe o *Pougues*, *S. Mion*, *Pont-Gibault*, *S. Flo ret*, *Petit Jaude*, *Jaude au Champ de Pauvres*, *Beaurepaire*, *Joſſe*, *Vic e Carladois*, *S. Alban*, *Andabre*, *Camu rets*, and *Prugniez.*

The Hot Waters, whoſe Salt hath reſemblance with Common Salt, conſi dered in Conjunction of its two dif ferent Parts, are thoſe of *Bourbon Lan cy*, *la Bourboule*, *Barbazan*, *Encauſ ſe*, *Balleruc*, *Bagniéres*, and *Barè ges.*

The Cold Waters, which alſo have the like Common Salt, are thoſe of *Cap vert*, and ſome others which have but a little, as thoſe of *Beſſe*, *Pons en Sain-*

tonge,

tonge, *la Rochepoſay*, *Vaujour*, *Chaſteau-Gontier*, *Premeau*, and *Provins*.

Likewiſe the Waters, Cold in their Springs, whoſe Salt may be referred to that Part of Common Salt, which is Chryſtallized thro Cold in a Humid, are thoſe of *la Trauliere*, *S. Pierre de Clermont*, and ſome few others.

But thoſe, whoſe Salt ſeems to be like that part of Common Salt, which is condens'd only by a total Evaporation of the Water wherein the Salt hath been diſſolved, are in greater number, and more conſiderable, as thoſe of *S. Reyne*, *Chaſtelguyon*, *Availles*, *Digne*, &c.

All theſe Obſervations of the Diverſity of Salts which have been found in theſe Waters, are General. The two Genders of Salts, Nitrous and Common, whereunto thoſe of theſe Waters are referr'd, do each comprehend ſeveral Species, whoſe Specific Differences are not eaſily comprehended; and the mixtures of theſe ſeveral Species together are ſtill in a greater number, and leſs known.

The

The Differences obſerved between the Nitrous Salts of theſe Waters, by melting them by Fire in ſmall Crucibles, have been theſe.

Some have become Blew, as doth the Salt of Tartar; ſuch were thoſe of *Martres de Veyre*, *Joſſe*, and *Sail lez Chaſteau Morand.*

Others took a Green Colour, as doth Salt-Petre Alcaliz'd by Coal; ſo did thoſe of the Waters of *Neris* and *Eſvahon.*

Others became Yellow, as that of the Water of *Vichy.*

Others became Ruddy, as thoſe of the Waters of *Chaudeſaigues*, *Mont d' Or*, and *S. Floret.*

Others became Tawny, as thoſe of the Waters of *Bourbon l' Archambaut*, *Andabre*, and *Prugniez.*

Others became Red, as thoſe of the Waters of *Pougues*, *Jaude*, *Beaurepaire*, and *S. Alban.*

Others became only Greyiſh, as thoſe of the Waters of *Vic le Comte* and *S. Mion.*

Others changed not their Colour, as that of the VVaters of *Vic en Carladois.*

As

As to the Differences obſerved between the Salts which may be referred to the Gender of Common Salt, beſide thoſe of the two different Saline ſubſtances before mentioned, whereof the one is Chryſtalliz'd thro Cold in a Humid, and which troubleth not the VVater of the Diſſolution of Salt of Tartar; and the other, which is not condens'd but by a total Evaporation of the VVater wherein this Salt is diſſolved, and which in an inſtant coagulates the Diſſolution of the Salt of Tartar, and of true Nitre; there have been remarked few other Particular differences.

Thoſe of the VVaters of divers Springs of *Bagniéres* being melted by Fire in the Crucibles, exhal'd forth Vapours which rendred the Flame of the Coals Blew; and afterwards theſe Salts being cool'd became of a clear Lacque-Colour.

That of the VVater of *Balleruc* was difficult to melt, and became Greyiſh: That of the VVater of *Availles* crackled in the Fire, as doth Sal-Marine.

That

That of the VVater of *S. Reyne* had a certain ſubtil Acrimony, as that of Sal Armoniac. Others had nothing Particular which was manifeſt.

There was not had much regard to the Obſervations of the Forms and Figures of each of theſe Salts, as well Nitrous as Common, in their Condenſation; becauſe theſe did vary in the ſame Salts, according to the manner and degree of the Evaporation of the VVater wherein they were diſſolv'd in order to be purified.

The Quantity of Salt, as well Nitrous as Common, wherewith each of theſe Mineral VVaters are Impregnated, cannot always be preciſely determined; it being not always equal in the VVaters of the ſame Springs, according to the Conſtitutions of the Air, wet or dry, and other Accidents. 'Tis ſufficient to remark only the Differences of much, little, or middle Quantity.

The waters which have been obſerv'd to have a remarkable and great Quantity of a Salt like to true Nitre, are thoſe of *Bourbon l' Archambaut*, *Vichy*, *Mont d' Or*, *Vic le Comte*, *Martres de*

de Veyre, *S. Mion*, *S. Floret*, and *Andabre.*

Thoſe which have but a Mediocrity, are thoſe of *Chaudeſaigues*, *Pougues*, *Pont-Gibault*, *S. Alban*, *Jaude*, *Beaurepaire*, *Joſſe*, *Vic en Carladois*, and *Prugniez.*

And thoſe which have little are thoſe of *Neris*, *Eſvahon*, and *Sail.*

The Salt which was found to have a reſemblance with Common Salt, was abundant in the VVaters of *Balleruc*, *la Bourboule*, *Chaſtelguyon*, and *Availles.*

There was a moderate Quantity in thoſe of *Bourbon Lancy*, *Bagniéres*, *Encauſſe*, and *Digne.*

But there was very little in thoſe of *Baréges*, *Capvert*, *Barbazan*, *la Trauliére*, *Beſſe*, *Pons en Saintonge*, *la Rochepoſay*, *Vaujour*, *Chaſteau-Gontier*, *S. Reyne*, *Premeau*, *Provins*, *Forges*, *S. Paul de Rouen*, *Beleſme*, *Hebecrevon*, *Reuilly*, *la Taille*, *Menetou*, *Bourberouge*, *Vaux*, *Montigny*, *Montboſq*, and *Pont-normand.*

There was no manifeſt Salt found in thoſe

those of *S. Pardoux*, *Bardon*, *Chanonat*, *Mans*, &c.

There hath not been found in any of these VVaters, either Alum or Vitriol discernible in their Sediments. These substances which are reckoned in the rank of Mineral Salts, are Concrete Juices, condens'd by Evaporation of the superabundant Humidity dissolving them. They participate of much Earthiness very fixt, and their Acid Spirits are not separated but by great Heat, which raiseth them with an Augmentation of a Corrosive Acidity.

The Taste somewhat Aigre or Vinous must needs proceed from other mixtures than those of Alum or Vitriol, since it is so easily lost in the open Air, when these VVaters are exposed thereto for a few days, and more speedily when they are a little warmed. In the Distillation of these VVaters *in Balneo Mariæ*, this Acidity is neither found in what is distill'd, nor in what remains in the Alembic, where no other Salts are to be found but Nitrous or Common.

Only the VVater of *Vahls* in *Dauphiné*, from a certain Spring called *la Dominique*,

minique, left after Distillation, a certain Salt having some resemblance to White Vitriol. It was of a Taste a little Vitriolic, sweetish, and somewhat Styptic. This Salt, being dissolv'd in Common Water, made the Tincture of Tournesole to become Red, almost as Vitriol doth; and being mixt with the Salt of Tartar, dissolv'd also in Common Water, became Black as Ink, and precipitated a Black Earth: It being otherwise with White Vitriol, which doth not so much blacken with the Salt of Tartar. It were proper to enquire whether this Water of *la Dominique* be Emetic, as that wherein Vitriol is dissolved; and whether it produceth Effects like to those Waters wherein there is a True, Compleat Vitriol.

The Brownish-Red, or Purple Colour, which Acid Mineral Waters take by the Infusion of certain substances, which with Vitriol make Ink, is no certain sign that Vitriol is the Cause of the Acidity of these Waters; in the most part whereof there is no Vitriol, but a Sulphurous Nitre capable to absorb

Vitriolic and Aluminous Acidities.

There were found in certain Sulphurous Earths Vaporous Juices not Coagulable, which are Acid, and do seem to be Vitriolic Seminaries, which may in time gain, by degrees, Concretions approaching to those of Vitriols. These Vaporous Juices meeting with the Waters of certain Springs, may give them a Vaporous Acidity; but which is easily lost, as those of the Waters of *Pougues*, *S. Mion*, *Vic le Comte*, *Vic en Carladois*, *Martres de Veyre*, *S. Parise*, *la Trauliére*, *Besse*, and several others. Tho when these Juices have any beginning of Concretion, there remains some part in the Sediments, after the Distillation of the Water, as in that of *la Dominique*, which nevertheless lost its Acidity by Heat.

As for the Earths which have been found in different Quantity in the Mineral Waters examin'd by the Academy, the particular Distinction of their Species hath been more difficult than that of the Species of their Salts.

There

There was found much Earth in the Waters of *Petit Bain*, *Bain de la Reyne*, and the Spring of *la Forgue* at *Bagniéres*, alſo in thoſe of *Barbazan*, *Encauſſe*, *Prugniez*, and *Chaſtelguyon*.

Moderately in thoſe of the *Grand Bain*, *Bain de S. Roch de Bagniéres*, *Capvert*, *Andabre*, *Bourbon l'Archambault*, *Vic le Comte*, *Martres de Veyre*, *S. Floret*, *Pierre de Clermont*, *Jaude*, *Joſſe*, *Digne*, *Pougues*, and *Paſſi*.

Little in thoſe of the Spring of *Salut de Bagniéres*, and in thoſe of *Baréges*, *Chaudeſaigues*, *Mont d' Or*, *Vic en Carladois*, *S. Mion*, *Beſſe*, *Vernet*, *Chanonat*, *Pont-Gibault*, *la Bourboule*, *S. Alban*, *Sail*, *la Trauliére*, *Vichy*, *Bourbon Lancy*, *Neris*, *Eſvahon*, *Pons en Saintonge*, *Montendre*, *la Fonſrouilleuſe*, *la Rochepoſay*, *Vaujour*, *Chaſteau-Gontier*, *Premeau*, *S. Reyne*, *Provins*, *Mans*, and in all thoſe of *Normandy*.

There was no manifeſt Earth found in the Waters of *Balleruc* and *Availles*, the Sediments whereof were wholly Saline.

The moſt part of theſe Earths were White and Subtil, as thoſe of the Waters of *Bagniéres*, *Capvert*, *Barbazan*,

Encauſſe, *Andabre*, *Prugniez*, *Vic en Carladois*, *Vic le Comte*, *Martres de Veyre*, *Beſſe*, *Vernet*, *Chaſtelguyon*, S. *Pierre de Clermont*, *Jaude*, *Pont-Gibault*, *la Bourboule*, *Foſſe*, S. *Alban*, *Sail*, *Neris*, *Eſvahon*, S. *Pariſe*, the two *Bourbons*, and *Pougues*.

Others were Grey, as thoſe of the Waters of *Baréges*, *Mont d' Or*, *Chaudeſaigues*, S. *Floret*, *Chanonat*, *Vichy*, *Bardon*, S. *Pardoux*, *la Trauliére*, *Pons*, *la Rochepoſay*, *Chaſteau-Gontier*, S. *Paul de Rouen*, *Beleſme*, *Premeau*, and *S. Reyne*.

Others Ruddy, as thoſe of the Waters of *Vaujour*, *Mans*, *Provins*, *Forges*, and almoſt all the other Waters of *Normandy*.

In Evaporation of all theſe Waters their Earths were in different Forms; ſome in that of Films ſwimming a top, as thoſe of the Waters of *Capvert*, *Barbazan*, *Encauſſe*, *Vic en Carladois*, *Vic le Comte*, *Martres de Veyre*, *Vernet*, S. *Alban*, *Vichy*, *Pougues*, S. *Pariſe*, and *Pons*.

Others in Flakes, as thoſe of the Waters of *Baréges*, *Andabre*, *Prugniez*, *S. Flo-*

S. *Floret*, *Chanonat*, S. *Pierre*, *la Bourboule*, and *Foſſe*.

Others in Mucilages, as thoſe of the Waters of *Chaudeſaigues*, *Vic en Carladois*, *Montendre*, *Vaujour*, *Mans*, and *Premeau*.

Others in Clods, as thoſe of the Waters of *Vic le Comte*, and *S. Mion*.

Others in Chaffy form, as thoſe of the Waters of *Chaſtelguyon*, *Beſſe*, *Bardon*, and *S. Pardoux*.

Others in ſmall ſandy Grains, as thoſe of the Waters of *la Fonſrouilleuſe*, *la Rochepoſay*, and *S. Reyne*.

Others in a ſubtil Brown Powder, as thoſe of the Waters of *Provins*, and almoſt all thoſe of *Normandy*.

There have been alſo obſerved ſome other Differences of theſe Earths, by putting them in diſtill'd Vinaigre, and burning them ſtrongly in the Fire.

Some were diſſolv'd almoſt totally in diſtill'd Vinaigre with an Effervescence, as doth the White Earth which reſults from the Coagulation of Natron, which is a Species of true Nitre; which Coagulation is made in an Inſtant, by

the Mixture of that part of Common Salt, which is not condens'd in a Humid. Such were the White Earths of some Nitrous Waters, as those of *Andabre*, *Prugniez*, *Martres de Veyre*, *S. Mion*, *S. Floret*, *Jaude*, *Pont-Gibault*, *Josse*, *Esvahon*, and *S. Alban*.

Others were dissolv'd only in part, and but little; as those of the Waters of *Chaudesaigues*, *Vic en Carladois*, *Vernet*, *Chastelguyon*, *la Bourboule*, *Vichy*, and *Bourbon l' Archambault*.

Others were not dissolv'd at all; as those of the Waters of *Bagniéres*, *Pons en Saintonge*, and *Premeau*.

Some others did only make the distill'd Vinaigre to take a high Tincture of a Hyacinth-Colour, which was lost in a few days by the Precipitation of a little Brown Powder, which seem'd to be Sulphurous, as that of the Waters of *Vaujour*, *la Rochepozay*, and *S. Paul de Rouen*.

The Fire hath also discovered certain other Differences of these Earths; for in burning them strongly in the Fire, some have changed Colour, others not, some

ſome have been Calcined, others Vitrified.

Of thoſe which were White, and changed Colour by Fire, ſome have become Dark-Grey, as that of the Water of *Vernet*; others Yellow, as that of the Water of *S. Floret*; others Ruddy as that of the Water of *Prugniez*; others Reddiſh, as that of the Waters of *Mont d' Or*, *Vic le Comte*, and *S. Alban*.

Some others have not changed Colour, as that of the Waters of *Bagniéres*, *Baréges*, *Capvert*, *Barbazan*, *Encauſſe*, *Chaudeſaigues*, &c.

Others were Calcin'd, as that of the Water of *Paſſi*, which was altogether Plaſtrous.

Others were Vitrified, as that of the Water of *Andabre*.

The Sulphurs, and Bitumens, as well Concrete, as Liquid, are not, according to their whole ſubſtance, mixt with theſe Waters, altho there is ſometimes found ſomewhat of them in certain Springs. There is only their Saline part which is diſſoluble in Water; that which is Fat & Inflammable being eaſily ſeparated. And to diſcover them among

these Waters, it were necessary to make Observations at their Springs and in their Basins. There has been none as yet found in those which have been sent to the Academy.

The other Mixtures less sensible have not been yet observed: But till Opportunity shall offer for their Discovery, if possible; the present Observations of the Qualities, Quantities, Agreements and Differences of Salts and Earths of so great a Number of Waters, which have been examined in the Royal Academy of the Sciences, and whereof we now make Public the Particular History, may be Useful and Serviceable to Physicians, who advise their Use, the better to make choice of those, which by reason of the mixture of these Mineral Substances which are more sensible, may fit their Intentions for the restoring of the Health of Persons Diseased.

Par-

Particular

OBSERVATIONS

On the

SALTS and EARTHS

OF

Mineral WATERS,

Which have been Examined in the Royal Academy of the Sciences.

ALL the Mineral Waters, which have been brought to and examined in the Academy were in their Springs, some Hot, some Tepid, and others Cold: They also differed among themselves according to the Observation of the Taste; some being somewhat Aigre or Vinous, others

Auſtere or Ferruginous; others without any Savour very manifeſt, or Inſipid. All theſe ſenſible Differences, joyn'd to thoſe which have been moſt remarkable in the Sediment of theſe Waters after Diſtillation or Evaporation, and principally in the Participation of certain Salts, whereof ſome had a reſemblance to Common Salt, others to the Nitre of the Ancients, have given occaſion to diſtribute them into certain Claſſes, thereby to diſpoſe in ſome order the particular Hiſtory of ſo great a Number of Obſervations which have been made in examining ſuch a Diverſity of Waters.

In the Firſt of theſe Claſſes are plac'd the Hot Waters, wherein was found a Salt having reſemblance to Common Salt.

In the Second are the Hot Waters, wherein was found a Salt reſembling the Nitre deſcrib'd by the Ancients.

In the Third are the Tepid and Inſipid Waters, whereof ſome have a Salt, either Common or Nitrous, and ſome have not.

In the Fourth are the Tepid, ſomewhat

what Aigre or Vinous Waters, which have ſome participation of the true Nitre.

In the Fifth are the Cold, Inſipid Waters, whereof ſome participate of a Salt reſembling Common Salt; others in their Sediments diſcover no Salt.

In the Sixth are the Cold Waters of a Ferruginous or Auſtere Taſte.

In the Seventh are the Cold Waters, of a Taſte ſomewhat Aigre or Vinous, which participate of Common Salt.

In the Eighth are the Cold Waters, likewiſe ſomewhat Aigre or Vinous, which participate of the true Nitre.

There were no Hot Waters found that were Vinous; nor Cold Inſipid Waters that were Nitrous.

The Firſt CLASS.

Of the Hot Waters, wherein was found a Salt reſembling Common Salt.

OF this ſort were the Waters of *Bourbon Lancy, la Bourboule, Eſvahon*

hon, or *Evos*, *Balleruc*, *Barbazan*, *Barèges*, *Bagniéres*, *Digne*, and *Bourbonne*.

Of the Waters of Bourbon Lancy, *in* Bourbonnois.

The great Number of Springs, the Magnificence of the Baths, the Antiquity of the Buildings, and the Care which our Kings have taken ſince the laſt Age in the repairing thereof, give to theſe Waters the Prerogative to be firſt conſidered.

The Experiments have been made on the Waters of *le Lymbe*, the Springs of *la Reyne*, *Eſcures*, and *S. Leger*, brought in the Beginning of the Spring-time.

The Water of the great Well which is called *le Lymbe*, is the warmeſt in its Spring: It was Limpid and without Taſte. Having been ſlowly diſtill'd, there was found no difference between what paſs'd firſt, and what laſt. It left at the bottom of the Cucurbites about $\frac{1}{64}$ Sediment, whitiſh and Salt, from whence was ſeparated $\frac{1}{30}$ Earth, the other $\frac{2}{30}$ were a pure Salt of the taſte of Common Salt, which was condens'd in Grains of a Cubic Figure, like Sal-Marine. This Water continued always Limpid in the Cucurbites during the diſtillation.

To

To examine the Quality of this Salt, by compariſon with Common Salt, They caus'd to be diſſolv'd the one, and the other, apart in four times the Quantity of Common Water, afterwards They mixt them with the like Quantity of Common Water wherein Mercury Sublimate had been diſſolv'd; and it was obſerved that by the mixture of the Salt of the Water of *le Lymbe* there was produced neither any Trouble, nor Precipitation in the Sublimate Water, as alſo neither in the diſſolution of Common Salt. The ſame was obſerv'd upon the Diſſolution of Vitriol, which was not troubled either by the Salt of the Water of *le Lymbe*, or by Common-Salt. Theſe two Salts being put apart into Common Water tinctur'd with Tourneſole, changed not the Blew Colour, as do Alum and Vitriol, and all other Acids which make it Red: But they did both alike precipitate the Salt of Lead diſſolv'd in Common Water, and filtrated thro Grey Paper.

Having thus compared the Salt of the Water of *le Lymbe* with Common Salt, and obſerv'd their Reſemblances

blances together, They afterwards remark'd the Differences of this Salt of the Water of *le Lymbe*, from Alum and Vitriol, as well by Sight as Taste, which they found Considerable; that by the Mixture made of these three substances dissolv'd apart in Common Water with the Tincture of Tournesole, the Blew Colour which chang'd into a Clear-Red by the mixture of Alum, and into a Dark-Red by the mixture of Vitriol, chang'd not at all by the Salt of the Water of *le Lymbe* no more than by Common-Salt.

In comparing this Salt of the Water of *le Lymbe* with other Mineral Salts, which are commonly known, it was observed that it fulminated not in the Fire with Combustible substances, as doth Salt-Petre; that the Taste of one had no resemblance with that of the other; that Salt-Petre dissolv'd in Common Water caus'd the Tincture of Tournesole to become somwhat Red; which the Salt of the Water of *le Lymbe* did not, & that Salt-Petre dissolv'd in Common Water troubled not the Dissolution of the Salt of Lead, as doth the Salt of the Water of *le Lymbe*.

It was also remark'd that this Salt of the

the Water of *le Lymbe* was different from true Nitre; forasmuch as the true Nitre, such as is the Natron of *Egypt*, and the Natural Borax, precipitated in an Orange-Colour Mercury Sublimate dissolv'd in Common Water, which the Salt of the Water of *le Lymbe* did not; which did not so much as trouble this Dissolution of Sublimate, as doth Sal-Gemm which renders it a little Milky, and as doth the Salt of Marle which whiteneth it still more.

By all these Comparisons of the Salt of the Water of *le Lymbe* with other known Salts, it was observed that it had resemblance only to Sal-Marine, and other like Common Salts which are used for seasoning and preservation of Victuals.

And because Sal-Gem, and the fixt Salt which is separated from Salt-Petre, in its refining, seem'd like to Common Salt, they examined both one and the other, to see to which of the two the Salt of the Water of *le Lymbe* had most resemblance, and it was observed that it did more resemble the fixt Salt of Salt-Petre than Sal-Gemm, and that herein it agreed also with Common Salt. Sal-Gemm dissolv'd in Water, and

and plac'd to evaporate by a gentle heat, does incruſt on the ſurface of the Water; it troubles and makes White the Limpid Diſſolution of Sublimate, it turns into Yellow the Green Tincture of the diſſolution of *German* Vitriol; and in a little time is condens'd in long and tranſparent Fibres in that Vitriol-Water; which the Salt of the Water of *le Lymbe* did not, as neither did Common Salt, and the fixt Salt of Salt-Petre.

There appeared nothing Bituminous or Sulphurous in all this Water, nor in its Sediments.

The other Waters of *Bourbon Lancy*, which were thoſe of the Springs of *la Reyne*, *Eſcures* & *S. Leger*, & which in their Sources have different Degrees of Heat, the firſt being moſt Warm, but leſs then that of *le Lymbe*, the ſecond leſs than the firſt, and the third only Tepid, were found to have like Sediments and in like proportion. All three had proportionably ſomewhat leſs Salt than that of *le Lymbe*, but otherwiſe their Salt was alike. In ℔ V. of theſe Waters there was almoſt ʒj of Salt.

The

The Salt of these Waters being melted by the Fire in Crucibles became only Grey; and the Earth separated from the Salt of the Water of *le Lymbe* changing its Colour by the Fire became very Brown, and contracted a certain Brackishness; but that of the Waters of the other Springs changed not.

Of the Waters of la Bourboule, *in the Parish of* Murat de Quairs.

The Water of the Bath of the Town, and that of the Spring above the Bath are alike. They were Limpid and manifestly Salt.

They were evaporated by a gentle heat, in Earthen Vessels, the better to observe the Changes arising.

During their Evaporation, made apart, there were form'd Whitish Flakes, which did swim in the middle of the Liquor, and by degrees were precipitated to the bottom.

The Total of the dry Sediment was $1\frac{1}{70}$ of the weight of the Water; it was almost all Salt, whence was separated only $\frac{1}{70}$ Greyish Earth, which suffer'd no change by the Fire; but partly dissolv'd in distill'd Vinaigre. The Salt of these Waters was found to re-

resemble Common Salt; which was experimented, as before, on the Salts of the Waters of *Bourbon Lancy*.

The Water of the Spring above the Bath, had more Salt, and less Earth than that of the Bath.

These Waters were taken in the beginning of the Spring-time.

Of the Water of Evahon, or Evos, in Combrailles.

The Water of the great Spring of the Baths was very Limpid and Insipid. It left after Evaporation $2\frac{1}{2}$ s White Fibrous Sediment, of a Saline taste, the Salt whereof being separated from its Earth, had a resemblance to Common Salt. It changed not its white Colour by the Fire, and its Earth was found almost all dissolv'd in distill'd Vinaigre.

This Water was taken in the Spring-time together with that of the little Spring of the Town; and because the Water of the little Spring was found different from that of the great one of the Baths; the Observations made thereon are referred to another Class.

The

The Water of the Baths of *Balleruc*, being ſent in the middle of the Summer, was found to be Limpid, but of a diſagreeable Taſte, and ſomewhat Salt. *Of the Water of* Balleruc, *in* Languedoc.

In Evaporation thereof there were made on the ſurface of the Water Saline Films; which being finiſh'd there remain'd $1\frac{1}{8}$ Salt reſembling Common Salt. It did not precipitate Mercury Sublimate diſſolv'd in Common Water, nor Vitriol ſo diſſolv'd, as doth the true Nitre. It cauſed not the Tincture of Tourneſole to become Red, as doth Vitriol and Alum. It fulminated not upon Burning Coals, as Salt-Petre, but thickn'd the Liquor of Salt of Tartar diſſolv'd, as doth the ſecond part of Sal-Marine, which ſtill retaineth a certain Mixture of the firſt, that hindereth it from Coagulating ſtrongly the Liquor of Salt of Tartar and Alcalies diſſolv'd by the Air, or in Common Water.

This Salt was not mixt with any Earth, which was ſeparable by its Diſſolution in Water. Being put in a Crucible on the Fire it was difficult to melt, and became Greyiſh.

The

Of the Water of Barbazan, *in le Commingeois.*

The Water of *Barbazan*, being taken in the middle of the Spring-time, was Limpid, and without any Taste very manifest. Only it left a certain Roughness upon the Tongue.

During Evaporation which was made by a Gentle Heat, there arose white Films, thick, and very like to those made by Quick-lime on the Surface of Water. The Evaporation being finish'd, these Films remain'd dry at the bottom of the Vessels, in their first form. Their weight was $\frac{1}{16}$ of that of the Water. They contain'd only about $\frac{1}{3}$ Salt, resembling Common-Salt. The Earth which was a sort of White Chalk, receiv'd no change by the Fire.

Of the Waters of Baréges, *in* la Bigorre.

The Water, which was taken up at the two Baths of *Baréges* about the middle of Summer, and was three Weeks before it came to our hands, smelt of the Fen and Mud.

These Waters being evaporated apart had their Surface cover'd with a subtil Greyish Film, & there were little Ruddish Flakes swimming in the middle. They left

left very little Sediment, Grey, Leafy, of a Saline Taſte; which was but $\frac{1}{100}$ of the whole. The ſmall Quantity of Salt which they contain'd had reſemblance to Common Salt conſider'd according to the Mixture of its two parts; ſo that the ſecond, which hath an Acidity, may ſurpaſs in Quantity the firſt, which hath none; for this Salt of the Waters of *Baréges* troubled and thickned the Diſſolution of Salt of Tartar.

Of the Water of Bagniéres *in* la Bigorre.

The Waters of *Bagniéres*, taken in the middle of the Spring-time, were thoſe of the little Bath, the Spring *de la Reyne*, the Bath of *S. Roch*, the great Bath, the Spring *de la Forgue*, and the Spring *de Salut*.

The Water of the little Bath, which is ſaid to be hot in its Spring, almoſt to the third Degree, was Limpid and without any manifeſt Taſte.

In the Evaporation there were form'd White and Thick Films on the ſurface of the Water, and the dry Sediment made $\frac{1}{88}$ of the weight of the Water whence it was ſeparated. It had $\frac{1}{3}$ Salt like

like to that of the Water of *Barèges*. The Earth freed from its Salt was White and very Subtil. It diſſolved not in diſtill'd Vinaigre, and chang'd not in the Fire either its Conſiſtence or Colour.

The Water of the Spring *de la Reyne*, which is ſaid to be no leſs Hot than that of the little Bath, was very Limpid and without Taſte.

There were alſo form'd Films on the Surface of the Water, in the Evaporation. The Sediment was $\frac{1}{44}$ o containing but $\frac{1}{4}$ Salt.

The Qualities of the Salt and Earth of this Sediment differ'd nothing from thoſe of the Salt and Earth of the Water of the little Bath.

The Water of the Bath of *S. Roch*, which in its Spring is likewiſe very Hot, was, as the others, very Clear and Inſipid.

In Evaporation there were form'd fewer Films on the Surface than in that of the little Bath, tho there was found more Sediment; for there was $\frac{1}{3}\frac{1}{4}$, whence was drawn $\frac{1}{3}$ Salt like to that of the Water of the little Bath,

and

and that of the Spring *de la Reyne*. The Earth was alſo alike.

The Water of the great Bath, which is the Hotteſt, and which is only us'd for Bathing, was likewiſe without Taſte, and very Limpid.

In Evaporation there were form'd Films on the Surface, as in that of the little Bath; but its Sediment was found much leſs: It was only $7\frac{1}{16}$ which contained not above $\frac{1}{4}$ Salt,

The Salt and Earth of this Water had the ſame Qualities with thoſe of the Salt and Earth of the Water of the little Bath.

The Water of the Spring *de la Forgue*, which is ſaid in its Source to be Hot in the firſt Degree, and fit to drink, was alſo very Limpid and Inſipid.

In Evaporation its Surface was covered with Films like to thoſe on the Water of the Spring *de la Reyne*. The Sediment remaining in form of a White Earth was $4\frac{1}{19}$, wherein was found ſomewhat more than $\frac{1}{4}$ Salt, nothing different from that of the Water of the Spring *de la Reyne*: Their Earths were alſo alike. The

The Water of the Spring *de Salut*, which is also proper for drinking, was, as the precedent, without Taste and very Clear.

There were form'd on its surface very few Films during Evaporation, and it left very little Sediment, amounting to no more than $\frac{1}{1600}$, which was almost nothing but a Salt resembling the other Salts of these Waters.

These Salts having been put apart in Crucibles on the Fire, to be melted, exhal'd some Spirits which made the Flame of the Coals of a Blew Colour; and being melted and cool'd, were found colour'd with a Redness of Clear Lacque, except the Salt of the Water of the Bath of *S. Roch*, which was onely Greyish.

Of the Water of Digne, *in* Provence.

The Water of the Baths of *Digne*, being taken in the middle of the Summer, had a little Saltness, which nevertheless rendred it not disagreeable to the Taste, and was very Limpid.

In its Sediment after Evaporation was found a Pure White Salt, resembling

bling Common-Salt, the Weight whereof was $\frac{1}{70}$ of the Weight of the Water.

This Salt caus'd the Liquor of the Salt of Tartar dissolv'd by the Humid Air to Coagulate in an instant; as doth that part of Sal-Marine which is not Condens'd, but by a Heat which causeth all the Humidity to evaporate that keeps it in a Liquid Consistence, after the Chrystallization of the other part thro Cold.

Of the Water of Bourbonne *in* Champagne.

The Water of the Baths of *Bourbonne*, taken in the Month of *August*, was of a Taste somewhat Saline: After Evaporation there was also found much Salt, to the Quantity of $1\frac{1}{42}$, without mixture of Earth, and it had resemblance to that part of Common Salt which is Condens'd and Chrystalliz'd thro Cold in a Humid; for it troubled not the Liquor of Salt of Tartar dissolv'd.

There appear'd to us in this Water nothing Bituminous; but there was found somewhat of that kind in the Mud of the Baths whence it was taken;

it being the Propriety of Bitumens, not to mix with Water. If they be Liquid, they swim a top; if they be Thick & Earthy, they settle to the bottom among the Mud, which they make black, and of an ill Scent, by reason of the Sulphurous Salt which abounds in those substances. Some of this Mud being put in a Glass-Retort, and distill'd by a Gradual Heat, there came forth a troubled and whitish Water, of a Scent somewhat Sulphurous; afterwards by force of Fire came over a Water somewhat of a Ruddy Colour, and an Oyl. This Ruddy Water was impregnated with a Volatile Salt, which caus'd Mercury Sublimate dissolv'd in Common-Water to precipitate: It precipitated also the Earth of Vitriol, as Sulphurous Salts do, and made an Effervescence with the Spirit of Salt. What remain'd of this Mud in the Retort after Distillation, retain'd still somewhat of a Sulphurous Salt mixt with Common Salt.

This Sulphurous Salt was so Fixt in the Earth of this Mud, that it could not be separated but by a very great Fire: Neither is it mixt with the Water of the

the Baths, whence this Mud is taken.

The Second CLASS.

Of the Hot Waters wherein there was found a Salt resembling Nitre, as describ'd by the Ancients.

OF this sort were the Waters of *Bourbon l'Archambault*, *Chaudesaigues*, *Mont d'Or*, *Neris*, the little Spring of *Esvahon*, the Baths of *Vichy*, and *Sail lez Chasteau-Morand*.

Of the Water of Bourbon l'Archambault, *in* Bourbonnois.

The Water of the Baths of *Bourbon l'Archambault*, taken in the Springtime, was Limpid, and of a Taste somewhat Nitrous.

During the Evaporation made by a Gentle Heat, to observe its Sediment; there were form'd on its Surface White Films, which afterwards precipitated in Flakes. The whole Sediment was found to be $\frac{1}{316}$ of the weight of the

Water, containing $\frac{1}{10}$ White Earth and $\frac{9}{10}$ Salt.

In examining this Salt, it was observ'd that it had a Lixivial Taste, and was purely Nitrous. The Nitre whereto the Naturalists of the Academy have thought fit to refer the Salt of the Water of the Baths of *Bourbon l'Archambault*, is the true Nitre describ'd by the Ancients; and commonly so call'd, which hath a resemblance to the Fixt Sulphurous Salt of Plants reduc'd into Ashes, and is different from Salt-Petre, which some Chymists take for Nitre. There is a kind of Fossil Nitre, which is taken out of the Earth in Grey, Compact and Hard Lumps. There is also a sort Soft, less Compact, White, which shoots forth upon the Ground in certain parts of Hot Countries. There are also Waters impregnated therewith, as that of *Nile*. The Natron of *Egypt*, and the Natural Borax are also Species thereof, and the Salt of Marle may be referr'd thereto, which is also a Sulphurous Salt, but which hath more resemblance to the Volatile Salt of Plants than to Alcalies. All these Nitrous Salts have

have ſomething Sulphurous, which is not found in Salt-Petre, unleſs Alcaliz'd, that is to ſay, reduc'd by the means of the Sulphur of Coals to the Nature and Quality of the Salt of the Herb *Kaly*. The Fixt Sulphurous Salts of Plants, and the true Nitres do cauſe Mercury Sublimate diſſolv'd in Common Water to precipitate in the Colour of the Rinds of Ripe Oranges: They make Syrup of Violets to turn Green; they reſtore the Blew Colour of Tourneſole, being changed and made Red by Acid Liquors. As alſo doth the Salt of the Water of the Baths of *Bourbon l' Archambault*; which Salt-Petre, Common Salt, Vitriol and Alum do not.

There was found nothing Bituminous in this Water, nor any thing of Sulphureity, except the Nitrous part of its Salt. The Earth of its Sediment had nothing of Fat; it diſſolv'd in part in diſtill'd Vinaigre.

In ℔ IV. of this Water there was found ʒjſs of Nitrous Salt, which Quantity is ſufficient to move the Belly & Purge as do Alcalies.

This great Quantity of true Nitre in the Water of the Warm Springs of *Bourbon l' Archambault*, may be considered as the Principal Cause of the Effects of this Water in those who drink thereof. And by the Consideration of the Proprieties of this sort of Salt, which are to heat, dry, attenuate, resolve, deterge, purge, *&c.* one may judge of the Agreeableness of this Water to the Constitutions of Persons Diseased, and the Quality of their Diseases, in order to advise the Use thereof.

Of the Water of Chaudesaigues, *in the High Country of* Auvergne.

This Water, being taken in the Spring time, was Limpid and Insipid, but of an ill Scent, it being Corrupted in the Bottles.

In Evaporation thereof by a Gentle Heat, there was made a Mucilaginous Sediment, like to Frog-spawn, of a Taste somewhat Saline, and which thickned like Gelly of Hartshorn. The whole dry Sediment amounted only to $\frac{1}{1000}$ of the weight of the Water. It contain'd a little more than the Moity of Salt.

The

The Salt of this Sediment was found to be Nitrous; for it precipitated Mercury Sublimate diſſolv'd in Common Water in the Colour of the Rinds of ripe Oranges; as doth the true Nitre, and all Lixivial Salts. It chang'd the Colour of Syrup of Violets into Green, and reſtored the Blew Colour of Tournesole being chang'd and made ſtrongly Red by Alum-Water.

This Salt being melted in a Crucible on the Fire, ſwell'd like Borax, and became Ruddy.

The Earth of this Water receiv'd no Change by the Fire, tho ſtrongly burnt in a Crucible: It diſſolv'd in part in diſtill'd Vinaigre.

Of the Water of Mont d' Or, *in* Auvergne.

This Water, being ſent at the ſame time with the precedent, was Inſipid, but ſomewhat Troubled.

It left after Evaporation $2\frac{1}{8}$ Whitiſh and Leafy Sediment, which was almoſt all Saline, having only $\frac{1}{3}$ Earth.

This Salt was likewiſe of the ſame Quality with the precedent, that is, Nitrous. Being put in a Crucible on the

Fire to melt, it ſwell'd not; it turned to a dark Red Colour; and its Earth being ſtrongly burnt in the Fire, became Reddiſh.

Of the Water of Neris, *in* Bourbonnois.

The Water of the Baths of *Neris*, taken in the Spring-time, was very Limpid and without Taſte.

Being evaporated by a moſt Gentle Heat, what remain'd in a dry Conſiſtence was in ſo little Quantity, that it made but $\frac{1}{672}$ of the weight of the Water.

This Sediment was Saline; and having been diſſolv'd in thrice as much Common Water, there was ſeparated from it a little Earth, and one part of the Water being gently evaporated, the Salt was condens'd thro Cold in Chryſtals very like to Salt-Petre refin'd, but they did not fulminate on burning Coals. They cauſed Mercury Sublimate diſſolv'd in Common Water to precipitate in an Orange Colour, as doth the true Nitre, and by other Experiments it was alſo found that this Salt was Nitrous, and had a reſemblance to Natural Borax.

The

The Sediment of this Water being put on the Fire, without ſeparating any of that little Earth mixt therewith, did melt and contract a Green Colour in the Crucible.

Of the Water of Eſvahon, *from the little Spring of the Town.*

This Water was found to differ much from that of the great Spring of the Baths of *Eſvahon*. It left after Evaporation $\frac{1}{80}$ very White and Leafy Sediment, of a Saline Taſte, the Salt whereof did reſemble that of the Water of *Neris*, and alſo contracted a certain Greenneſs by the Fire.

Of the Water of la Grille de Vichy, *in* Bourbonnois.

The Waters of *Vichy* are ſome Hot, ſome Tepid, and others Cold. The Hot and Tepid which were examin'd in the Academy, did participate of the true Nitre. They were taken in the Spring-time.

The Water of the *Grande Grille*, which is Warm in its Spring, was Limpid, of a weak Scent, and of a Taſte ſomewhat Nitrous.

During Evaporation there were form'd Greyiſh Films on the Surface of the Water. And at laſt was made a

Saline Concretion, which being dry, amounted to $\frac{1}{76}$ of the weight of the Water; whence was separated $\frac{1}{2}$ Grey, Fibrous Earth.

The Dissolution of this Salt depurated and freed from its Earth, having been evaporated, the first Concretion was made in Long, White, Transparent Chrystals like to Salt-Petre, but fulminated not upon burning Coals; and what was condens'd last in little Ruddish Grains had a Lixivial Taste. All this Salt was Nitrous, as that of the Water of the Baths of *Bourbon l' Archambault*. The great Quantity of this Nitrous Salt doth necessarily conclude this Water more proper for Bathing than Drinking, for in ℔ iv. of Water there was found of Salt ʒiij.

This Salt, having been melted in the Fire, became Yellowish. Its Earth in part dissolv'd in distill'd Vinaigre, and changed not by the Fire.

Of the Water of Sail lez Chasteau-Morand.

The Water of *Sail* was Limpid, and agreeable to drink, having no Taste. It was taken in the Spring-time.

Being evaporated, it left very little Se-

Sediment, which was Greyish, Leasy, of a Nitrous and Lixivial Taste. The small Quantity of Salt found therein had resemblance to true Nitre.

One part of this Sediment, not freed from its Salt, being put in a Crucible on the Fire, did melt and became Blew, as doth Salt of Tartar which hath been a long time melting.

The Third CLASS.

Of Tepid Insipid Waters, whereof some did partake of a little Salt, others had none.

THE Number of Tepid Insipid Waters which have been examined in the Academy, hath not been great. There were only those of *Encausse*, *Premeau*, *Bardon*, and two Springs of *Vichy*. This Class being not large by reason of the small Number of this Sort of Waters, the other Differences of these Waters taken from the Diversity of their Salts, have not been so much considered as to make separate Classes. This

Of the Water of Encausse, *in le Commingeois.*

This Water, being taken in the middle of the Spring-time, was very Limpid, without any Taste very manifest, except that it was a little Austere.

During the Evaporation made by a Gentle Heat, the surface of this Water was cover'd with White Films, broad, and thick, like to those which are made in the Dissolution of Quick-lime in Common Water.

The whole Sediment was found to be $\frac{1}{290}$ White substance, whence was separated almost $\frac{1}{3}$ Salt, which was like to Common Salt, according to the Experiment practis'd on that of the Water of *Bourbon Lancy*. Being melted by the Fire it became Whiter than before.

Of the Water of Premeau, *in* Burgundy *near* Nuits.

This Water, being taken at the end of the Summer, was Limpid and without Taste, agreeable enough to drink; and had a certain Detersive Quality.

To find out whether this Water participated of any Bituminous Substance of the Scent of Amber, as hath been written, it was distill'd in Glass-Alembics *in Balneo Mariæ*. What came over into the Recipients had no Scent, and

and appear'd not different from that which was not put to Diſtillation. Neither was there found any Sediment which had either the Conſiſtence or Scent of Amber or Bitumen.

It was alſo evaporated in Earthen Veſſels by a Gentle Heat, but what was evaporated had no Scent. During the Operation there was ſeen to ſwim in this Water certain little Grey Mucilages, and towards the end the Surface of the Water was cover'd with a Grey, Sandy Film; and the ſides of the Veſſels were lin'd with a Subtil, Grey Sand. Towards the bottom were Mucilages, which had nothing Bituminous. Theſe Mucilages being dried were reduc'd to a Leafy Earth, and the whole Sediment, as well Leafy as Sandy, was in very little Quantity, and amounted but to $\frac{1}{720}$ of the weight of the Water.

In this Sediment there was a little Salt of the Taſte and Quality of Common Salt. The Earth was not Diſſoluble in Spirit of Vinaigre. Being put on the Fire, and burnt, it became White.

This

Of the Water of Bardon, *near* Moulins.

This Water, being taken in the Spring-time, was Limpid and Insipid. Being evaporated it left but very little Greyish, Leafy Earth, without any manifest Salt.

Of the Water of the Tepid Springs of Vichy, *in* Bourbonnois.

The Water of the Great Basin, which is said to be somewhat Acid in its Spring, was found Insipid being brought hither.

In Evaporation there were form'd little Films on the surface, and after Evaporation the Sediment was $1\frac{1}{16}$ of the Weight of the Water; which consisted of a Salt mixt with $\frac{1}{2}$, Greyish, Fibrous Earth, which was separated from it. This Salt was of a Nitrous Quality, as that of the *Grille* of the same place. Being melted in a Crucible on the Fire, it took a Tawny Colour.

The Water of the little Basins was somewhat Aigre; and resembling that of the great Basin. Its Salt was alike, and in the same Proportion.

The

The Fourth CLASS.

Of Waters Tepid, somewhat Aigre or Vinous, which have some participation of true Nitre.

OF this sort were the Waters of *Vic le Comte*, *Vic en Carladois*, *Martres de Veyre*, *Jaude*, *Champ des Pauvres*, and *Beaurepaire*.

This Water of *Vic le Comte*, from the Fountain *du Cornet*, taken in the Spring time, was very Limpid, of a Taste somewhat Aigre and Vinous. It left no Impression of Dryness on the Tongue. *Of the Water of* Vic le Comte, *in* Auvergne.

Because the Acidity of this and other like Waters, which receive a Tincture with Galls, Pomegranate-Bark, Myrobalans, *&c.* as do those wherein there is Vitriol, may seem to proceed from a participation of some Vitriolic Vapours, it was resolved to see whether by Distillation there could be separated any Spirit different from the rest of the Water: Where-

Wherefore it being put to distil in Glass-Alembics by a very Gentle Heat, there was carefully observ'd whether there did arise any Acrimonious Vapour, like to that which affects the Nose of them who drink those Waters, which are somewhat Aigre and Vinous at their Rise from their Springs. But what did rise and distil from the very beginning had neither Scent nor Taste; and what remain'd in the Alembics, instead of Acidity, had only a little Brackishness, which was augmented toward the End of the Distillation.

By these Experiments repeated on other Waters, which were likewise somewhat Aigre, it may be judg'd that the Acidity of these Waters proceeds from some subtil Mineral Vapour not Condensable, or which easily changeth its Acidity into Brackishness.

This Water of *Vic le Comte* was also evaporated in open Vessels, and it was observ'd that during the Evaporation there were form'd on the Surface little Films, which settled to the bottom in the form of little stony Clods. The Evaporation being finish'd there remain'd

main'd $\frac{1}{192}$. White Sediment, whence was drawn almoſt $\frac{2}{3}$ Salt reſembling true Nitre. This Salt being melted on the Fire in a Crucible, ſwelled not, and became only Greyiſh.

The Earth of this Sediment, which was White, being burnt in the Fire, became Reddiſh. It diſſolv'd in part in diſtil'd Vinaigre.

Of the Water of Vic, *in* Carladois.

This Water, taken at the ſame time with the former, was found very Limpid, and of a Taſte ſomewhat Aigre.

There were form'd in Evaporation very ſubtil White Films on the Surface of the Water; towards the end whereof there was made a White Sediment, Mucilaginous, of a Saline Taſte, which being Dry, amounted but to $\frac{1}{250}$ of the Weight of the Water; wherein was a Moity of Salt having a Nitrous Quality, which being melted by the Fire, changed not its Colour.

The Earth of this Sediment diſſolv'd in part in diſtil'd Vinaigre, and being ſtrongly burnt in the Fire, became Greyiſh and ſomewhat Brackiſh.

This

Of the Water of Martres de Veyre, *in* Auvergne.

This Water, taken from the Rock of the Baths in the Spring-time, was very Limpid, of a Taſte ſomewhat Aigre and Vinous; leaving on the Tongue a certain impreſſion of Dryneſs. There was found in the Bottles a ſmall Quantity of Ruddiſh Sediment.

During Evaporation there were form'd Films, White and very Subtil ſwimming thereon, which ſettling fixt themſelves round about the Veſſels. The Sediment of the whole Water evaporated to Dryneſs was White, of a Saline Taſte, and its Quantity amounted to $\frac{1}{144}$ of the weight of the Water, whence was drawn almoſt a Moity of Nitrous Salt. This Salt having been melted on the Fire in a Crucible, became of a Blewiſh Colour.

The Earth being plac'd on the Fire, was ſtrongly burnt, chang'd its Colour very little; but it became Cloddy, and contracted a certain Brackiſhneſs. Before and after the Ignition, it diſſolv'd almoſt wholly in diſtil'd Vinaigre, with an Effervescence, as doth the Earthy, White and Inſipid ſubſtance which reſults from the mixture of the true

true Nitre, or of any Alkali, with that part of Common Salt which is not Condens'd thro Cold, and in a Humid.

Of the Water of Jaude in Auvergne.

There were brought in the Spring-time, Waters from three Springs of *Jaude*, which are the little Spring of *Jaude*, that of *Champ des Pauvres*, and that of *Beaure-paire*.

The Water of the first was very Limpid, of a Taste somewhat Aigre or Vinous, and left a certain Impression of Dryness on the Tongue.

In pouring out the Water from the Bottles in order to evaporation, there were found at the bottom some Sediments of a *Feuille-morte* Colour, which were separated.

During Evaporation the Water was not troubled; nor had therein either Films or Flakes. What remain'd dry, amounted to $\frac{1}{533}$ of the weight of the Water; being a Greyish substance containing almost a Moity of Salt which had resemblance to true Nitre, and which being melted on the Fire in a Crucible, took a Red Colour.

The

The Earth of this Sediment dissolv'd almost wholly in distil'd Vinaigre, with much Effervescence; but changed not in the Fire.

The Water of *Champ des Pauvres* was altogether like to the former, its Sediments alike, and its Salt also Nitrous.

That of *Beaurepaire* had nothing different from the other two.

The Salts of these three Waters having been melted apart on the Fire in Crucibles, took a Red Colour more or less deep, according to the different degree of the Fire.

The Fifth CLASS.

Of Cold Insipid Waters, which participate somewhat of a Salt resembling Common Salt, and some others in the Sediments whereof no Salt was found.

OF this sort were the Waters of *Capvert*, *Availles*, the Spring of *Jonas* at *Bour-*

Bourbon l'Archambault, S. Reine, Auteuil, Biévre, Paſſy, Chaſteau-Gontier, Vaujour, la Rochepoſay, Pons, Montendre, la Fronſrouilleuſe, Mans, Beleſme, and *Verberie.*

Of the Water of Capvert, *in* la Bigorre.

This Water, taken in the middle of the Spring-time, was Limpid, without Scent or Taſte.

In Evaporation by a very Gentle heat, there were form'd on the Surface of the Water White Films, like to thoſe which are made upon Water wherein Marle Calcin'd hath been put. The Sediment of the whole Water evaporated was $7\frac{1}{4}$ s, whence was ſeparated $\frac{1}{4}$ Salt, reſembling Sal-Marine, conſidered in the Conjunction of its two different parts.

The Earth of the Sediment of this Water loſt not its Whiteneſs in the Fire, and remain'd after a very ſtrong Ignition without any manifeſt Change.

The Salt alſo being melted in a Crucible on the Fire, changed not its Colour.

This

Of the Water of Availles, *in* Poictou.

This Water taken in the beginning of Autumn was Limpid, and of a Taste somewhat Brackish.

In Evaporation there was form'd on the Surface a Film which cover'd it all over, the matter whereof was rough both to the Feeling and Taste, as a very fine Sand, or Cream of Tartar pulveriz'd. There were no Mucilages made therein, and toward the end of the Evaporation the Water became very Brackish: There remain'd at the bottom $\frac{1}{30}$ pure Salt, very Acrimonious, partly in great Cubical Grains, like the Salt of *Brouage*, partly in a solid Mass. This Salt caus'd the Liquor of Salt of Tartar diffolv'd, to coagulate, as doth the second part of Sal-Marine. Being put in a Crucible on the Fire to melt, it crackled as Common Salt; afterwards it exhal'd a Scent of Spirit of Salt; and after having been melted it became Grey.

Of the Water of Jonas, *at* Bourbon l'Archambault.

This Water, being taken in the beginning of the Spring-time, was Limpid, and without manifest Taste.

Being evaporated it left only $\frac{1}{30}$ leafy

leafy Sediment, very White, encompassed with some Ruddish Earthiness. This Sediment had so little Brackishness, that it was not sensible to the Taste: Nevertheless it thickned the Liquor of Salt of Tartar dissolv'd, as doth the second part of Sal-Marine.

This Earth in part dissolv'd in distil'd Vinaigre, but chang'd not in the Fire.

Of the Water of S. Reyne, *in* Burgundy.

This Water, being taken in the beginning of Summer, was Limpid, without Scent or Taste, and agreeable to drink.

During Evaporation the Surface of the Water was cover'd with a Subtil, Grey Film, Sandy and Insipid; and toward the end it became thicker. The whole being evaporated there was found only $\frac{1}{1536}$ Sediment, partly in White Leaves, very fine, and partly in Ruddish Gum, of a very Acute Saline Taste, and almost as Piquant as Sal Armoniac.

The Salt of this Sediment being dissolv'd in Common Water, and mixt with the Tincture of Tournesole, did not

not turn it Red, as do Alum and Vitriol; neither did it precipitate Mercury Sublimate dissolv'd in Common Water, as doth the true Nitre: But it did coagulate strongly the Liquor of Salt of Tartar dissolv'd, as doth the second part of Sal-Marine; which Salt-Petre and Sal-Gem do not.

Of the Water of Auteuil, *near* Paris. This Water, being taken in the beginning of the Summer, was Limpid and Insipid. During Evaporation it continued Limpid without Films or Flakes. Toward the end there was separated a very little Sediment, which being dry'd was found to be White and of a Saline Taste. Its weight was only $\frac{1}{5\,5\,0\,0}$ of the weight of the Water. The Salt of this Sediment had resemblance to that part of Common Salt, which is Chrystalliz'd thro Cold.

Of the Water of Passy, *near* Paris. This Water, being taken at the beginning of Summer, was not very Limpid: It appeared Whitish, and its Taste seem'd to be Plastrous: It left a certain Roughness and Dryness on the Tongue.

During

During Evaporation it forc'd out on its Surface certain Little, Grey, Discontinued Films; and left $\frac{1}{30}$ Sediment, partly in Grey Leaves, partly in Glistering Fibres, like Crude Plaster. This Sediment contain'd $\frac{1}{7}$ Salt, which had resemblance to the second part of Sal-Marine, and did coagulate the Salt of Tartar dissolv'd in Common Water.

The Earth of this Sediment did Calcine in the Fire like Plaster; and by tempering it with Water, it stuck together, as doth burnt Plaster.

Of the Water of Biévre, *near* Paris.

This Water, which some have judg'd to be Mineral, was very Limpid, and almost Insipid.

After Evaporation there remain'd so little Sediment, that it scarcely amounted to $\frac{1}{700}$, of the Weight of the Water. It consisted of a White, Leafy Earth, of a Taste very little Brackish, resembling that of Common Salt.

Of the Water of Chasteau Gontier, *in* Anjou.

This Water, likewise by some thought Mineral, was Limpid, and without manifest Taste. The little Sediment which it left, being evaporated, made

but $\frac{1}{1000}$ of the Weight of the Water; being a Grey Earth, very Brackish, the Salt whereof resembled both parts of Sal-Marine conjoyn'd.

Of the Water of Vaujour, *in the Dutchy of* la Vallière.

This Water was Limpid and Insipid. Its Sediment, after Evaporation, was in very small Quantity; containing a Ruddish Earth, somewhat Brackish, which gathered together in little Ruddish Mucilages swimming in the Water, that toward the end did stick to the sides of the Vessels, and, as it were, lin'd them.

The Salt of this Sediment resembled Common Salt, and its Earth being put in a little Crucible on the Fire, did half melt, and was reduc'd into Clods. It dissolv'd somewhat in distil'd Vinaigre, which took thence a Hyacinth-Colour; but that afterwards precipitated into a deep Brown.

Of the Water of la Roche-posay, *in* Touraine.

This Water, taken at the beginning of Summer, was Limpid, and without Taste. During Evaporation the Surface was cover'd with a White, Sandy Powder, which also did stick to the sides of the Vessels; there remaining at last but very

very little of a Grey, Sandy Earth, of a Taſte a little Brackiſh, which made only about $\frac{1}{1000}$ of the weight of the Water.

The little Quantity of Salt, which was in this Sediment, might be referr'd to Common Salt. The Earth being put on the Fire became White. It diſſolv'd not in diſtil'd Vinaigre, which nevertheleſs was charg'd with a Hyacinth Colour; but this Colour was diſſipated next Day by the Precipitation of ſome Powder.

Of the Water of Pons, *in* Saintonge.

This Water, being taken at the end of the Summer, was Limpid & without Taſt. During Evaporation there were form'd on the Surface little white Films, very Subtil, and, as it were, Sandy. There remain'd a ſmall Quantity of Earthy matter, Greyiſh, Light, Fibrous, of a Taſte a little Brackiſh, which amounted not to ſo much as $\frac{1}{3000}$ of the weight of the Water.

The little Salt which was in this Sediment, ſeem'd not different from Common Salt. The Earth, ſeparated from the Salt, being burnt in the Fire, be-

came somewhat White. It was not dissoluble in distil'd Vinaigre.

Of the Water of Montendre.

This Water, taken at the same time with the former, was Limpid, but it scented of the Fen.

During Evaporation it continued also Limpid; only there appear'd toward the End very few Grey Mucilages; and there remain'd at last less Sediment than in that of *Pons*; consisting of a Grey, Brackish Earth, the Salt whereof had resemblance to Common Salt.

Of the Water of Fonsronilleuse.

This Water, being taken at the same time with the other, was Limpid, and likewise scented of the Fen.

During Evaporation it continued also Limpid; which being finisht, the sides and bottom of the Vessels were found slightly lin'd with a little Sandy Earth, Dark-Grey, somewhat Brackish, the Quantity whereof was somewhat more than that of the Sediment of the Water of *Montendre*, and less than that of *Pons*.

The Salt of this Sediment did likewise resemble Common Salt.

The

The Water of the Mineral Spring of *Mans*, being taken at the beginning of Summer, was Limpid and without Taste. *Of the Water of* Mans.

During Evaporation there were form'd Concretions of little Ruddish Mucilages, and the whole being evaporated, there remain'd only a little Ruddish Earth, without manifest Brackishness.

This Earth having been strongly burnt in the Fire, receiv'd no apparent Change.

This Water, being taken in the Month of *July*, was Limpid and Insipid. *Of the Water of* Belesme, *in* Normandy.

During Evaporation it continued Limpid till towards the end, when there appeared on the Surface of the remainder a certain subtil Film: There remain'd at last very little Grey, Insipid Earth, and somewhat Rugged to the Feeling.

This Water, taken at the end of *June*, was Limpid and without Taste. *Of the Water of* Verberie, *near* Compiegne.

There was found at the bottom of

the Bottles a little Ruddy Sediment, and what was made by Evaporation was in very little Quantity; being a Ruddy, Leafy Earth, and without Brackishness.

The Sixth CLASS.

Of Cold Waters having a Ferruginous, or Austere Taste.

OF this sort are the Waters of *Forges*, *S. Paul de Rouen*, *Bourberouge*, *Menitoue*, *Pont-Normand*, *Montbosq*, *Hebecrevon*, *Provins*, *Apougny*, and *Vahls*.

Of the Water of Forges *in* Normandy.

These Waters, being taken at the end of the Summer, had a Taste somewhat Ferruginous.

The several Waters of *la Source Royale*, *la Reynette*, *la Cardinale*, being evaporated apart, did all leave very little Sediment, of a Dark-Ruddy Colour, somewhat Brackish, and what little Salt they had was like Common Salt, and had no resemblance to Vitriol; their

their Earths were also Ferruginous.

Of the Water of S. Paul de Rouen.

This Water, taken toward the end of the Month of *June*, was Limpid and without any manifest Taste, except a light Roughness, which impress a Dryness upon the Tongue. There was found at the bottom of the Bottles a small Quantity of Light Sediment, of a Yellowish Colour, inclining towards Ruddy.

During Evaporation there were form'd Ruddy Mucilages, which precipitated to the bottom, and there stuck to the sides of the Vessels a little Ruddy Earth, the whole in very little Quantity, and without manifest Brackishness.

Of the Waters of Bourbe-rouge, Menitoue, Pont-Normand, *near* Morrain, *in* Normandy.

This Earth, being put into distil'd Vinaigre, made it to take a Hyacinth-Colour, but what gave it that Colour, did afterwards precipitate in a Brown Powder.

These Waters of *l' Election de Mortain*, in *Normandy*, were taken in the Spring-time. The Water of *Bourbe-rouge* hath receiv'd its Name from the

Ruddy Earth, which is found in its Rivulet resembling Rust of Iron. It was Limpid, and of a Taste somewhat Ferruginous.

Being evaporated, it left about the Vessels a slight Ruddish Crust, of a Saline Taste, and at the bottom another small whitish and Insipid Crust.

The Waters of *Menitoue* and *Pont-Normand* were found altogether like to that of *Bourberouge*.

Of the Water of Montbosq, *in* l'Election de Bayeux.

This Water, being taken in the Spring-time, was very Limpid, and of a Taste somewhat resembling that of Iron.

The Sediment which it left after Evaporation was only a little Ruddy Earth, of the Taste of Common Salt.

Of the Water of Hebecrevon, *near* S. Lo, *in* L'Election de Carantan.

This Water, being likewise taken in the Spring-time, had a Taste manifestly Ferruginous.

In Evaporation it left very little Sediment; which was only a little Ruddish and Saline Earth, sticking to the sides of the Vessels.

The

Of the Water of Provins.

The Water of *Provins* from the Fountain *de la Croix*, being taken at the end of Summer, was troubled, and of a Ferruginous Taſte.

During Evaporation by a gentle Heat, the Surface was covered with many Grey Films, diſtinct from one another. There was made a Precipitation of a little ſubtil Earth, of the Colour of Iron-Ruſt, which ſtuck to the ſides of the Veſſels, which after Evaporation were found lin'd therewith; and above this lining of Ruſt were the Grey Films. That part of this Red Earth, which ſtuck uppermoſt in Circular form, was ſomwhat Brackiſh, and grew moiſt by the Air; and what was loweſt toward the bottom of the Veſſels, was not Brackiſh, and did not grow moiſt. The whole being dry'd and put together weighed only 1 $\frac{1}{2}$ 94.

There being pour'd Water upon this Sediment, in order to diſſolve the Salt which it contain'd, and the diſſolution being filtrated thro Grey Paper, and the greateſt part of the Water evaporated, there was made a Grey Sediment; and the Liquor being pour'd into ano-

ther Vessel to be still in part evaporated, and afterward being expos'd to the Air, there was condens'd a little Salt in broad, flat Grains, having the Taste of Common Salt. This Salt had nothing Aluminous nor Vitriolic, neither had it resemblance to any thing but that part of Sal-Marine, which is Chrystalliz'd thro Cold and in a Humid.

The Earth of the Sediment of this Water in part dissolv'd in distill'd Vinaigre, which it turn'd Yellow. Being burnt in the Fire, it took a Colour more Brown, and seem'd to resemble the Rust of Iron.

Of the Water of Apougny, *near* Seignelay, *in* Burgundy.

This Water, being taken in the Spring-time, was Limpid, and of a Ferruginous Taste.

During Evaporation, there were separated Ruddish Earths, very Light, in Flakes, which did swim in the middle of the Water, and afterwards stuck to the sides of the Vessels. These Earths being dry'd had a little Brackishness, and their Quantity was very small.

This

This Water, taken in the Month of *May*, did ſeem very ſingular, and much different from other Ferruginous Waters, having ſomewhat Vitriolic.

Of the Water of Vahls, *in* Dauphiné, *from the Spring called* la Dominique.

It was Limpid and without Scent; but its Taſte was Vinous and Styptic, like to that of a ſmall White-Wine, wherein a little Vitriol is diſſolv'd. Its Stypticity was ſtrong and diſagreeable. It took a Black Colour, drawing towards Blew, with Galls; as doth Water wherein Engliſh Vitriol hath been diſſolv'd. It made the Tincture of Tourneſole of a Red Purple Colour, as doth the ſaid Vitriol; but being mixt with the Liquor of Salt of Tartar, it made no Precipitation, as it doth with Vitriol, and the whole Liquor became very Green. There was made at the bottom of the Bottles a little Yellowiſh Sediment, as happens in Water wherein there is a Ferruginous Vitriol.

This Water being put in Alembics to diſtil by a gentle Heat, as ſoon as it began to become Tepid, it loſt its firſt Taſte, and was no longer Acid; but retain'd only a Ferruginous Taſte. What diſtill'd in the beginning was Inſipid,

ſipid, and alſo what followed, and the whole reſembled ſimple Water. There remain'd only $\frac{1}{1000}$ Greyiſh Subſtance, which had ſome reſemblance to Vitriol lightly Calcin'd; having the Taſte, but more gentle. This Saline ſubſtance being diſſolv'd in Common Water, and mixt with the Liquor of Salt of Tartar, became Black as Ink, with a certain Precipitation. Vitriol doth not make the like Blackneſs with the Liquor of Salt of Tartar.

Thoſe who have drunk this Water, have found it Heavy on the Stomach, and Emetic, and that it purgeth downwards, and makes their Stools Black.

The Seventh CLASS.

Of Cold Waters, having a Taſte ſomewhat Aigre or Vinous, which participate of Common Salt, or have no Salt at all.

OF this ſort were the Waters of *Chaſtelguyon, Beſſe, S. Pierre, la Trauliére,*

liére, Vernet, Chanonat, S. Pardoux, S. Pariſe, and Rueilly.

This Water, taken in the beginning of Spring-time, was Limpid, but had made ſome whitiſh Sediments in the Bottles. Its Taſte did a little incline to ſomewhat Aigre, and was a little Vinous. *Of the Water of* Chaſtelguyon, *near* Rion, *in* Auvergne.

During Evaporation there were form'd on the Surface White Films, very Thick, which cover'd it all over; but afterwards precipitated to the bottom of the Veſſels in thick Scales. The Sediment was $\frac{1}{72}$, one Moity whereof was Salt, the other Earth.

This Salt was very Acrimonious, and might be compar'd to that part of Sal-Marine, which is not Condens'd thro Cold and in a Humid, which was known by mixing it with the Liquor of Salt of Tartar, which it caus'd to coagulate. This Salt being melted in a Crucible on the Fire, fum'd and produc'd a Scent of the Spirit of Common Salt.

The Earth of this Sediment in part diſſolv'd in diſtil'd Vinaigre. It contracted ſomewhat of Brackiſhneſs in the Fire, and chang'd its Whiteneſs in a Yellowiſh Colour. This

Of the Water of Besse, *near* Mont d' Or, *in* Auvergne.

This Water, taken at the beginning of the Spring-time, was Limpid, and of a very strong Vinous Taste.

During a Gentle Evaporation it was observ'd, that there were form'd on its Surface very little Greyish Films, and that some Ruddish Powder stuck to the sides of the Vessels. There remain'd at last at the bottom a Whitish, Leafy Earth, almost Insipid, which amounted to $\frac{1}{64}$. of the weight of the Water. There could be separated from thence but very little Salt, which did resemble that of the Water of *Chastelguyon*.

This Earth being freed from its Salt, and strongly burnt in the Fire, became somewhat Reddish; and before it was put on the Fire, it in part dissolv'd in distil'd Vinaigre.

As for the Vinous Taste of this Water, altho it was very strong, yet it was soon lost by the heat of the Fire; as was that of other Mineral Waters, which were somewhat Aigre and less Vinous. In the distillation what pass'd in the beginning was Insipid, as also what pass'd in the middle, and end thereof.

This

This Water, taken at the beginning of the Spring-time, was Limpid, but had made some Whitish Sediments in the Bottles. Its Taste inclin'd to somewhat Aigre and Vinous. *Of the Water of* S. Pierre de Clermont, *in* Auvergne.

During Evaporation there were form'd on its Surface White Films, which precipitated in little Flakes. The whole dry Sediment amounted to $\frac{1}{20}$ of the weight of the Water, whence was drawn almost a Moity of Salt, resembling that part of Sal-Marine, which is Chrystalliz'd thro Cold and in a Humid, and which mixeth without trouble with Alcalies, or fixt Sulphurous Salts of Plants dissolv'd in Common Water.

The Earth of this Sediment being freed from its Salt, as much as could be by hot Water, dissolv'd with great effervescence in Spirit of Vinaigre. It contracted in the Fire a Remarkable Brackishness, and its Whiteness became Greyish.

Of the Water of Chanonat, *near* Clermont, *in* Auvergne.

This Water, being taken in Spring-time, was very Limpid, and inclining to somewhat Aigre.

It

It left after Evaporation a little Whitish Sediment, which was heapt together in little Flakes, amounting to about $1\frac{8}{30}$, without mixture of any manifest Salt.

This Earth dissolv'd almost wholly with an Effervescence in Spirit of Vinaigre, and became Reddish in the Fire.

Of the Water of Vernet, *near* Senectaire, *in* Auvergne.

This Water, taken in the Beginning of the Spring-time, was very Limpid, of a Taste somewhat Aigre and Vinous.

In Evaporation its whole Surface was cover'd with a Fat Film. The Sediment was in very small Quantity; consisting of a little Leafy, Greyish and Insipid Earth, which in part dissolv'd in distill'd Vinaigre; and being burnt in the Fire, its Colour was darkned.

Of the Water of S. Pardoux, *in* Bourbonnois.

This Water, being taken in the Spring-time, was also somewhat Aigre and Vinous.

Being evaporated, it likewise left a small Quantity of Insipid Earth.

This

This Water, taken in the beginning of Spring-time, was Limpid, its Taſte was ſomewhat Aigre and Piquant. *Of the Water of* la Trauliére, *near* S. Pardoux.

It was evaporated without Films, without Flakes, and without being troubled, and left a little Earthy Sediment of an Aſh-Colour, and of a Taſte ſomewhat Saline. The ſmall Quantity of Salt which it contain'd, was found to reſemble that part of Sal-Marine which is Chryſtalliz'd thro Cold and in a Humid: Foraſmuch as it troubled not the Diſſolutions of Alcalies and true Nitres.

This Water, taken in the Spring-time, was Limpid, of a Taſte ſomewhat Aigre, which left a certain Harſhneſs on the Tongue. *Of the Water of* S. Pariſe, *in* Nivernois.

During Evaporation there were form'd on the Surface Broad and White Films. The whole Sediment was $\frac{1}{57}$ of the weight of the Water; conſiſting of a Whitiſh, Leafy Earth, without mixture of Salt. It was diſſoluble in diſtill'd Vinaigre, and chang'd not in the Fire.

The

The Eighth CLASS.

Of Cold Waters somewhat Aigre and Vinous, which participate of a Salt resembling the Nitre of the Ancients.

OF this Quality are the Waters of *Pougues, S. Mion, S. Floret, Pont-Gibault, Josse, S. Arban, Camarets,* and *Vahls.*

Of the Water of Pougues, *in* Nivernois.

This Water, taken in the Spring-time, was Limpid, of an Acid Taste, and disagreeable to drink.

During Evaporation its Surface was cover'd with White Films, which stuck to the sides of the Vessels, according as the Water diminished. There remain'd at last a Whitish, Leafy Sediment, of a Saline Taste, amounting to $\frac{1}{32}$ of the weight of the Water; whence was drawn almost $\frac{1}{3}$ Salt, having the Qualities of the true Nitre, which were known by Experiments like to

to those, which were made on the Salt of the Hot Water of *Bourbon L' Archambault.*

This Salt, being melted in a Crucible on the Fire, took a bright Red Colour, which it kept being cool'd. The Earth of this Sediment in part dissolv'd in distill'd Vinaigre.

Of the Water of S. Mion, *in* Auvergne.

This Water, taken in the Spring-time, was Limpid, somewhat Aigre, and Vinous.

During Evaporation there were form'd some White Films, swimming on its Surface, which afterwards by degrees precipitated, and stuck to the sides of the Vessels, there being also made some little Flakes in the middle of the Water. There remain'd at last a White, Cloddy Substance, of a Taste very Lixivial, the weight whereof was $\frac{1}{30}$ of the weight of the Water; whence was separated almost $\frac{2}{3}$ Salt, which was Nitrous as that of the Water of *Pougues.*

This Salt being melted in a Crucible became only Greyish. The Earth of the Sediment dissolv'd with Effervescence in distill'd Vinaigre; and being burnt

burnt in the Fire, became a little Reddish.

The Experiments on this Water having been resum'd at the instance of a Person of Great Quality, who affirm'd to have receiv'd benefit by the Use thereof, which he design'd to repeat; it was observ'd that the Water sent by him was Limpid and somewhat Aigre. It took no Colour with Galls, and its weight exceeded not that of the Water of the Fountains of *Paris*, which come from the Springs of *Rongis*, by above $\frac{1}{100}$. And altho this Water had no more sensible Acidity to the Taste, yet it turn'd the Blew Tincture of Tournesole somewhat into Red, giving it a Purple Colour. This Water being put to Distillation *in Balneo Mariæ*, what pass'd first in very little Quantity, did turn the Tincture of Tournesole less Red, but it somewhat troubled the Water of the Dissolution of Mercury Sublimate; which it did not before Distillation, nor did that which afterwards distill'd. What came at last did not turn Red the Tincture of Tournesole; and altho it troubled not the Dissolution of Mercury Sublimate,

it

it remarkably troubled that of Vitriol, and precipitated thence a Yellowiſh Powder. What remain'd of Earth and Salt, after Diſtillation, was found like to what was obſerv'd and related before.

Of the Water of S. Floret, near S. Cirque, in Auvergne.

This Water, taken in the Spring-ſeaſon, was Limpid and ſomewhat Aigre.

During Evaporation there were amaſs'd together certain little Ruddiſh Flakes, which ſticking to the ſides of the Veſſels form'd Groſs Scales. The Sediment was found Ruddiſh, Leafy, and Saline: It amounted to $3\frac{1}{2}3$, whence was drawn almoſt $\frac{1}{2}$ Salt, reſembling the true Nitre.

This Salt, being melted in a Crucible on the Fire, became Ruddy; and the Earth of the Sediment being freed from the Salt, diſſolv'd almoſt wholly in diſtill'd Vinaigre with great Effervescence, and contracted in the Fire a certain Brackiſhneſs, and Yellowiſh Colour.

Of the Water of Pont-Gibault, in Auvergne.

This Water, taken in the Spring-time, as all the others of *Auvergne* which were ſent to the Academy, was Limpid,

pid, somewhat Aigre, and Vinous.

During Evaporation there appeared no Concretion till towards the end, when there remain'd a White Sediment; the weight whereof was $\frac{1}{16}$ of the weight of the Water: Wherein was found a little more than $\frac{1}{4}$ Nitrous Salt, resembling that of the Water of *S. Mion.*

The Earth of this Sediment in part dissolv'd in distil'd Vinaigre with an Effervescence; and became a little Brown in the Fire, without receiving any other manifest Alteration.

Of the Water of Josse, lez Maringues.

The Water sent from *Josse* in the Spring-time, was of two Springs, the one call'd *le Petit Bouillon*, the other *le Grand Bouillon.*

The former was very Limpid, of a Taste somewhat Aigre, a little Vinous; leaving on the Tongue an Impression of Dryness.

During Evaporation there were form'd on the Surface little Films, which precipitated in small Flakes, and stuck to the sides of the Vessels. The dry Sediment amounted to $\frac{3}{44}$ of its weight;

weight; whence was extracted more than ½ Ruddiſh Salt, of a Lixivial Scent, and which was diſcover'd to be Nitrous. It became Blewiſh after having been melted in the Fire.

The Earth freed from this Salt, in part diſſolv'd, with an Effervescence, in diſtil'd Vinaigre, and chang'd not its Colour by the Fire.

The Water of the latter had a Vinous Taſte, ſtronger than the other; but its Sediments were alike, and its Salt likewiſe Nitrous.

Of the Water of S Arban, in Foreſt.

This Water, taken in the Spring-time, was very Limpid, ſomewhat Aigre, and a little Vinous.

During Evaporation, made by a gentle heat, there were form'd on the Surface whitiſh Films, Subtil, Inſipid, and Sandy, being Rough to the Feeling and Taſte, as a very fine Sand. The whole dry Sediment was 6 ½₀ Whitiſh, Leafy Subſtance, of a Lixivial Taſte; whence was drawn about ½ Nitrous Salt, condens'd in Thick Tablets.

The Earth of this Sediment diſſolv'd almoſt wholly, with an Effervescence, in

in distil'd Vinaigre, and took by the Fire a small Redness as of Clear-Lacque.

Of the Water of Pont de Camarets, *in* Languedoc.

At *Pont de Camarets*, between the Dioceses of *S. Pons*, *Alby*, and *Castres*, there are two Springs of Cold Water, distant two hundred Paces one from another, the highest call'd the Spring of *Andabre*, the lowest the Spring of *Prugniez*; the former, being sent in the Month of *May*, was Limpid, and of a Taste a little Vinous.

Being put to evaporate, there were form'd no Films on its Surface, but there precipitated a Whitish Earth in little Flakes. The dry Sediment was found to be $\frac{1}{200}$, having more than $\frac{3}{4}$ Nitrous Salt.

The Earth of this Sediment being put in distil'd Vinaigre, dissolv'd almost wholly with an Effervescence. Being strongly burnt in a Crucible on the Fire, it became almost Vitrified. Another part of this Earth being mixt with an equal part of its Salt, and put on the Fire to melt, in part pierc'd thro the Crucible, which was found on the outside,

ſide, as it were, lin'd with a Brown Email, and the inſide of the Crucible was cover'd with a Clear-Red Email. The remainder of this ſubſtance became White at the bottom of the Crucible, after having ſwell'd very much.

The other Water was very Limpid, and of a Taſte more Vinous than the former; during Evaporation there were not form'd any Films ſwimming on the Surface but only little White Flakes, which precipitated to the bottom. The wholedry Sediment was $\frac{1}{54}$ of the weight of the Water; and that Quantity was proportionally leſs than that of the Sediment of the Water of *Andabre*. It contain'd alſo leſs Salt, which was only a Moity; being Nitrous as the other, and its Earth was leſs Diſſoluble in diſtill'd Vinaigre, and leſs Fuſible in the Fire.

Of the Water of Vahls, *from the Springs* la Marquiſe, *and* la Marie.

Near *Vahls*, in *Dauphiné*, there are four Springs of Mineral Water, which are, *la Dominique*, *S. Jean*, *la Marquiſe*, & *la Marie*. The Water of the firſt being different from the other, the Experiments thereon have been refer'd to the Sixth Claſs.

The Water of the Spring of *S. Jean*, said to be a little Tepid and somewhat Aigre, was not sent to the Academy, because it had the same Qualities with the latter, being only a little more weak.

The Water of *la Marquise*, the Spring whereof is near that of *S. Jean*, is Cold. 'Tis said its Taste is somewhat Aigre, and a little stronger than that of *S. Jean*; and that it purges more, as well by Siege as Urine. When we receiv'd this Water, its Taste seem'd rather Brackish than Acid, and it was judg'd that the Acidity which it hath in its Spring was weakned by Carriage.

After Evaporation it left only a Nitrous Salt without mixture of Earth; being $1\frac{1}{3}$ *s*, White, and very Lixivial. It precipitated in a *Minim* Colour Mercury Sublimate dissolv'd in common Water, as doth Salt of Tartar, and made a great Effervescence with the Spirit of Common Salt, as do the Acrimonious Sulphurous Salts.

The Water of the Spring *la Marie*, which is not far from *la Marquise*, hath more

more Acidity than the other, according to report, and makes those who drink of it to urine more. We found therein no Acidity, but only a little Brackishness, as in the former. The Salt of its Sediment was found alike, and in less Quantity; being only $1\frac{1}{97}$.

Additions of the Mineral Waters of Chartres *and* Spa.

THe design'd Impression of these Observations having been a long time hindred; in order to joyn this Treatise with other Works of the Naturalists of this Assembly, hath given occasion to add here the Experiments made on a Mineral Water lately discover'd near the City of *Chartres*, and also on the Water of *Spa*, which was brought for the use of the Queen.

Of the Water of Chartres, *in* Beausse.

This Water being brought to the Laboratory of the King's Library, toward the end of the Summer, scented somewhat of the Mud. It took not with Galls that dark Red, which is

ſaid that it takes, newly from its Spring: Which happens to ſeveral weak Mineral Waters, which preſently loſe that diſpoſition in the Air.

Being put to diſtil by a gentle heat, what paſs'd firſt differ'd very little from what diſtill'd laſt, and the whole appear'd nothing different from Common Water. The dry Sediment of ℔ viii. of this Water diſtill'd, weighed only Gr. xx. which contain'd but Gr. iv. of a Ruddy and Gummous Salt, of an Acrimonious Taſte, and reſembling that of the Salt which is drawn from Common Earth. The remainder was a ſubtil Powder of a Grey Ruddiſh Colour, which diſſolv'd not in diſtill'd Vinaigre. There was perceiv'd in this Water but little of Vaporous Sulphureity. This Water, according to the Obſervations made thereon, ought to be rang'd in the Seventh Claſs.

The Cures, which many Perſons troubled with divers Diſtempers have ſaid to have receiv'd by the Uſe thereof, have excited the Curious to examine well its Qualities upon the place, and the Conditions of its Springs. They have

have obſerv'd that this Water was found in ſeveral places of a Meadow near the Walls of the City, between the two Arms of the River, in certain Furrows, whence it ſprings, and runs towards one of the Channels. This Water being newly ſprung out of the Earth, hath the Propriety of extracting a Tincture from Galls; but there are other Furrows, where the Water having no Courſe, loſeth, by ſtanding in the Air, this Propriety. And becauſe in all the Ditches newly made in this Meadow, there is found Water having the ſame Taſte, and doing the ſame effect with Galls, and that in ſome places of the Cauſſey which ſeparateth the Channel of the River from the Meadow, there runs a Water which hath alſo this Propriety of extracting a Tincture from Galls, it hath been judg'd that all the Water of the Meadow comes from this River, and that it takes a Mineral Quality in paſſing thro this Earth, which renders it wholeſom and proper for the Cure of many Diſeaſes; and that this Water may be ſo much the better, foraſmuch as being before expos'd to the Air in the

Channel of the River, it hath not that Crudity which those Waters have which proceed from deep Earths and Rocks.

Whether its Mineral Quality be taken from the Earth of this Meadow, it were possible to discover somwhat by Experiment on this Earth, observ'd as well in its Surface as at bottom, if the soaking thro of the Water of the River hindereth not the search.

Of the Water of Spa.

This Water of *Spa*, brought into *France*, for the Use of the Queen about the end of Summer, and sent to the Laboratory of the King's Library, to be examin'd, was in four Bottles; one whereof was but half-full, having been ill stop't and the Water run out. The Water of this Bottle was a little troubled; and altho it was still of a Taste moderately inclining to somewhat Aigre and Vinous, it tinctur'd not with Galls. The Water of the other three Bottles, which had been well stopt and were full, was very Limpid and of a Taste somewhat Aigre and Vinous. It took a *Mimm* Colour with Galls.

Being mixt with the Dissolution of

Mer-

Mercury Sublimate made in Common Water, it troubled and rendred it Milky; and mixt with the Diſſolution of *German* Vitriol likewiſe made in Water, it troubled that alſo, and in a little time there was made a Precipitation of Ruddiſh, ſubtil Earth; as do thoſe Waters wherein there is a Sulphurous Salt. The Acidity of this Water hindereth it not from troubling and precipitating Salt of Lead diſſolv'd in Common Water: It made the Tincture of Tourneſole to turn little Red, which a leſs Acidity turneth much: Which gives occaſion to judg that the Acidity of this Water is not Simple.

Being put to diſtil by a very gentle heat in a high Glaſs-Alembic, to ſeparate the more Volatile and Subtil part, what paſs'd firſt was not found different from what followed and what remain'd in the Cucurbite ceaſing Diſtillation, after having drawn about $\frac{1}{4}$; neither was there any Acidity in the whole Water. What remain'd in the Cucurbit having been put in an Earthen Veſſel upon warm Aſhes to evaporate gently, in order to obſerve whether there were made any Concretions during Evapo-

ration; this Water remain'd always Limpid; and when there were no more than two Ounces in the Veſſel, there were made new Eſſays, to know the Quality of the Salt therein, by putting a little of this Water as well in the Diſſolution of Mercury Sublimate made in Common Water, which it troubled and made Milky, as on that of *German* Vitriol, which it alſo troubled with a certain Precipitation of Ruddiſh Earth, and alſo on Syrup of Violets, which became Green. All which Effects were Proofs of a Sulphurous Salt, confirming thoſe drawn from the former Eſſays.

The Veſſel wherein the Evaporation was made, was found lin'd in its upper part near the edge, and all about, with a Saline Concretion, and lower toward the bottom it was lin'd with a Yellowiſh Earth almoſt Inſipid, but a little Reſtringent.

The Evaporation being finiſh'd, there remain'd of the whole Quantity of this Water, which was ℔ vij. ℥vj. ʒvj. an Earthy and ſomewhat Saline Sediment, being all over the inward Surface of the Veſſel. This Sediment being taken thence weigh'd only Gr. xlviij. whereof

whereof ¼ were a Light, Subtil, Ruddiſh Earth, and ¼ was a Sulphurous Salt, which caus'd Mercury Sublimate to precipitate of a White Colour, as doth the Salt of Marle, and alſo the Volatile Salts of Plants and Animals, and not of a Red or Orange Colour, as do the true Nitres and Alcalies. This Particularity would have oblig'd us to have made a Ninth Claſs, wherein to have plac'd this foreign Water, if we had found the like in *France*, to have fill'd it up.

Advertiſements and Corollaries.

THe great Quantity of Mineral Water, which Phyſicians cauſe them to drink, to whom they preſcribe the Uſe thereof, for the Cure of ſome Rebellious Diſeaſes, which yield not to Ordinary Remedies; gives occaſion to judge that the Principal Effect which they expect, is the cleanſing of the *Viſcera* by this Inward Waſhing. This Effect is conſiderable, becauſe the moſt part of Chronical Diſeaſes proceed from the Obſtruction of the *Viſcera*, which this

great Quantity of Drink may resolve. The Ease, which many Patients receive, is the reason why few Physicians give themselves the trouble of searching the particular Qualities of these Waters; which are nevertheless very different, and considerable enough to deserve Inquiry, in order to make the better use of them, according to the Diversity of Diseases, and the different Constitution of the Diseased.

'Tis easy to judge that all Waters of Running Springs; such as are the Mineral Waters which are us'd in Physic, may have particular different Qualities; if it be considered, that some of these Waters come from Places near the Surface of the Earth, others from certain Places more Deep. Those which have not been able to penetrate further, because of Beds of Stone, or Fat Earth, which happen underneath, rest on this sort of Bottoms, and run out only where they find any Passages. They have their Originals either from the fall of Rain-Waters, or by the Percolation of the Waters of Rivers and Lakes, or of the Sea, thro the Neighbouring Earths,

Earths, or those which they can reach; and in traversing these Earths, which are less compact, they dissolve the Salts which are there, and impregnate themselves with certain Subtil, Earthy Particles which are found by Evaporation. The Water which comes from Places more Deep, whither its Weight caus'd it to fall, according as it could pass, cannot rise again in its Liquid Consistence without force; but being rarified by some inward heat of the Earth, it riseth in Vapours; afterwards resuming its first and Natural Liquid Consistence, by the Cold toward the Surface of the Earth, in coming forth it produceth Springs, and also little Lakes on the highest Mountains, whither it may very well rise, since that it mounteth even to the middle Region of the Air, where Snow is form'd, and whence Rain falls. These Waters being rarified in the Profundities of the Earth, whence they rise, receive easily Mixtures of Mineral Exhalations and Vapours, which are frequent in these Places; but these Mixtures being not often distinguish'd in these Waters rising from their Springs,

either

either by Scent or Taſte, cannot be underſtood but by their Effects; the Aſſignment whereof to their proper Cauſes is not always eaſy and certain.

The Information, which we give here, of the Salts and Earths of ſeveral Mineral Waters, will not fully ſatisfie the Curioſity of thoſe who would be likewiſe inſtructed concerning the other Cauſes of the Proprieties of theſe Waters; ſince that beſides the mixture of Concrete ſubſtances found in them, according to the Obſervations here related, there may alſo be contain'd ſubſtances not Concrete, ſo Subtil and ſo Volatile, that there can remain nothing in the Sediments which may be perceiv'd to differ from the Salts and Earths; and which is not at all found in what paſſes by Diſtillation. This Taſte ſomewhat Aigre or Vinous, which is loſt in the Air and by Heat, ought to have for its Subject a Spirituous and moſt Volatil Subſtance, which it were very deſirable, were known. The Heat which ſome have in their Springs, and at coming out of the Earth, may be attributed

buted to hot Vapours which are mixt with them in their Course thro Subterraneous Profundities; where the Cold of the Air has no free access: And some particular Effects of these Waters on diverse Subjects, give occasion to judge that they are not Pure and Simple. Wherefore the Academy hath propos'd to labour, in order to the enquiry of these things, for the Satisfaction of the Curious and Public Benefit.

In the mean while the Observations of the Salts and Earths of these Waters may serve as well in Physic as for Mechanic Arts; to make a judgment of the fitness of some of these Waters for certain design'd Uses.

The two Genders of Salts, under which are rang'd the Salts of those Waters, whereof hitherto hath been spoken, may possibly have Differences which divide each of these Genders into several Species; as the Naturalists of the Royal Academy have remark'd in Salts drawn from the Ashes of several Plants; which have been observ'd some to resemble the true Nitre, others Common Salt, & to retain the participation of the

the Specific Proprieties of their Subjects.

Some of the Earths which are found together with these Salts in the Sediments of Mineral Waters evaporated or distill'd, may have particular Uses, according to their Differences. Some *Germans* have remark'd that the White Earth of the Mineral Water of Schwalbach is Purgative. They had in the Academy some Bottles of this Water, the Taste whereof was Vinous and Strong. The Salt of its Sediment was Nitrous, and caus'd Mercury Sublimate dissolv'd in Common Water to precipitate in a * deep Crimson, as do the Alcalies of Plants. The Earth separated from this Sediment was White as Chalk, but there was not Quantity enough to make Experiment of its Purgative Faculty, and we had neglected to observe this in several like Earths taken from the Nitrous Waters of this Kingdom. The true Nitre of the Ancients, being Sulphurous, and having resemblance to the Alcalies of Plants, hath likewise this Propriety, with them, to move by Siege. And this White Earth which is found with Nitrous Salts of Mineral Waters may

* Nacarate.

may participate of the same Quality, even as the *Coagulum* of the Salt of Tartar made by the Second part of Sal-Marine, retains some Properties of its Salt, altho it be Insipid, and not Dissoluble in Water, but only in Acid Liquors, such as is distill'd Vinaigre, which dissolves it with an Effervescence; the like whereof hath been observ'd in several White Earths of Nitrous Mineral Waters.

As to the Observation of the Tasts of the Waters brought to us, we have been only able to judge, by what hath been remark'd by tasting them at their arrival. They who are upon the Place of their Springs may better make a distinction, particularly in those which are somewhat Aigre and Vinous, the Taste whereof is either weakened or lost by being kept or expos'd to the Air. They may also better perceive the Degrees of their Colouring with Powders of Galls, Oak-leaves, Myrobalans, Pomegranate-barks, and other like substances; and also judge more precisely of their Consistence and Weight. The Naturalists of the Royal Academy

Academy have not been able to observe exactly all these things in the Waters which have been sent them from distant Places, and which might have receiv'd several Changes as well by Time as Carriage, both in their Taste and Disposition to take Colours with certain Substances, and in their Consistence more or less Thin and Subtil. The Method which they have followed in their Experiments on the Waters which have been sent them, may be serviceable to those who will examine them at their Springs, in order to gain a more exact knowledg of them.

This Vaporous Substance of Mineral Waters, which are somewhat Aigre and Vinous, is probably the first Being of Mineral Sulphur, and of the Concretions thence arising. There are found Earths impregnated with this Acid, Vaporous, Sulphurous Substance, from the Concretion whereof are sometimes made Sulphurous and Vitriolic Minerals. And for the most part there is not made any Mineral Concretion discernable in these Earths, where there is not found either Mineral Sulphur, or Vitriol, or Metal. This Mineral, Va-

porous, and Indigested Substance may very well be the Principle of Vitriol, but in its first state it cannot be a Vitriolic Product, if it be in those Earths where there is not already somewhat of Vitriol. It is more easy to observe it in its Products, when it hath receiv'd some Mineral Concretion. The Humid Air penetrating into the Mineral Stones, which are Insipid, but impregnated with a Mineral Sulphur, which is easily perceiv'd when 'tis disengag'd by Fire, does manifestly give to the Taste a Sulphurous Acidity, which before was not sensible. And of the Concrete Sulphur of these Mineral Stones or Marchasites penetrated by the Humid Air, is made a Concrete, Vitriolic Juice, which is the Product of this Mineral Sulphur, the Principle whereof hath been an Acid and most Vaporous Substance. Which also hath been observ'd in many Clayie Earths expos'd to the Air, which dissolving into Powder, contracted at first an Acidity more sensible to the Nose than to the Tongue; afterwards there were made Sulphurous and Inflammable Concretions, and at length Saline Concretions which were reduc'd to Vitriol. This

This Subtil, Vaporous Substance, Acid, or rather Harsh, produceth not always Vitriolic Concretions; and it happens in many Earths that thro default of requisite dispositions it remains in its first Being. Then it is not a Vapour of Vitriol, and the Mineral Waters which pass thro the Earths where this Subtil Matter is found, and which contract an Acidity by mixture therewith, ought not to be call'd Vitriolic. We have observ'd in many Waters impregnated with this Acid Vapour, that nevertheless there was not found there any true Vitriol, or any Substance resembling Alum, and that the Salt which remain'd in their Sediments was a Nitre, such as the Ancients have describ'd, and which is as far different from Vitriol and Alum, as are Alcalies, or fixt Sulphurous Salts of Plants.

The Salts, Vitriols, Alums, and other Concrete Substances dissoluble in Water, may be so mixt with Mineral Waters, that they may not be much perceivable except in their Sediments; but the Sulphurs and Bitumens are always easie to be discern'd in the Waters wherein

wherein they are contain'd, becauſe they either ſettle or ſwim on the Surface, being not capable of mixture as the Salts. We have not perceiv'd any in the Waters which have been ſent us. Thoſe which were the Hotteſt in their Springs have not ſeem'd to us more Sulphurous and Bituminous than the others. And if there is found any Sulphur or Bitumen in their Baſins upon the ſides of their Receptacles, or in their Mud, it may be that theſe are not thoſe Inflammable Subſtances in the Earth which have rendred them Hot. It is more probable that they contract this Heat by the mixture of ſome Hot Vapours, which they meet with in Deep places thro which they paſs. Experience doth ſufficiently ſhew that no Combuſtible matter takes Fire, or keeps it long without Air; and that to extinguiſh the Fire of Sulphurs and Bitumens inflam'd, it is enough to hinder them from the Communication of the Air, by covering well the Veſſels which contain theſe Subſtances. The Sulphurs which burn in Certain Cavities of Mountains diſcover'd do not take Fire, but

in

in those places where they take Air; and when that which lies open is spent, the Fire ceases in what remains cover'd, altho it be equally Combustible. And if some Substances take a Fire strong enough not to be stifled under Ground, it causeth what covereth it to crack, to give it self Vent and take Air, as doth Powder in Mines.

If there are not perpetual Subterraneous Fires, the Heat of some Mineral Waters, which continue to be Hot in their Springs, cannot be attributed to them. It is more probable that there are in several places of the Earth Hot Vapours and Exhalations, the Heat whereof is preserv'd in places Deep and Close, where the Air doth not penetrate to cool them, and where these substances Rarifi'd have not room enough to distend themselves more, and suffer some weakning of their Heat, or Dissipation by a more great Rarefaction. But the Heat of these Vapours may be augmented by their pressing together in Close Passages, whereinto they insinuate themselves; and if they meet with Waters running thro the same Passages, they may heat them by mixing with them. There

There have been made ſome Obſervations which give occaſion to judge that the Waters of Hot Springs and Natural Baths are made warm by Hot Vapors which paſs with them.

I. That theſe Hot Mineral Waters burn not the Mouth and Tongue of thoſe who drink of them at their coming forth from their Springs, as Common Water heated by Fire to a like Degree would do. Which ſeems to proceed from the Subtilty of the Subſtance which produceth this Heat in the Water. The Flame of Spirit of Wine burns not the Hand ſo ſtrongly, as that of a burning Coal.

II. That the Heat of Mineral Waters doth not act on ſome tender ſubſtances, as doth that of Common Water rais'd by Fire to the ſame Degree; for it hath been ſeen that Dock-Leaves, which were ſoftned and boyl'd eaſily enough in Common Water, moderately heated on the Fire, did not ſoften in the Mineral Waters of *Neris* in *Bourbonnois*, which are the Hotteſt in *France*, and which are rendred difficult to drink by the exceſs of their Heat; but theſe

Leaves

Leaves only chang'd Colour, and became Yellowish, like dead dry'd Leaves. Which gives occasion to judge that this Heat proceeds from some Vapour or Exhalation different from Water, and more proper to dry than to soften, as doth Common Water, which humects.

III. That these Waters are more Hot in their Springs by Night than by Day. Which may be caus'd by the Cool of the Air, which hindereth the Dissipation of the Hot Vapours and Exhalations which are mixt with them.

IV. That these Waters being expos'd to the Air, from out their Springs, cool'd not so soon as doth Common Water heated by Fire. Because the Cold Air, which maketh the Motion excited by the Fire in Common Water soon to cease, keeps in the Hot Vapours which warm the Mineral Waters by their mixture, and hindereth them from dispersing so soon.

V. That Hot Mineral Waters have no more Disposition to Boyl on the Fire than Common Cold Waters, there being as much time requir'd to cause the one to boyl as the other. Which clearly

shews

ſhews that the Heat which Mineral Waters contract in the Earth, proceeds not from a Motion of their Particles excited by any Subterraneous Fire; for this Motion being continued and augmented by the Fire of a Chimney or Furnace, would cauſe them to boyl ſooner than thoſe which being Cold have not that Diſpoſition by a Motion Commenc'd. Wherefore the Heat of Mineral Waters proceeds from certain Warm Vapours or Exhalations mingled with them, which the Fire drives away before they can boyl thereon.

If there is without Fire in the Earth, any Heat ſtrong enough to warm the Waters of ſome Springs, it muſt neceſſarily be that this Heat, which is communicated to Waters which are Warm from ſome Thouſands of Years, and perhaps have ever been ſo, in order to perpetuate ſelf, keeps in Deep places, and far diſtant from the Surface of the Earth, where the Air which encompaſſeth that, might weaken it by its Cold, which ſeems to be the moſt extreme. According to this ſuppoſition, the Difference of Waters of Hot and Cold

Cold Springs, whereof ſome are obſerv'd to make like Sediments, and to have Salts of the ſame Species, ſhould proceed from this, that theſe Waters paſs in the Earth thro Places more or leſs Deep. We obſerve that Waters which run on the Surface of the Earth are Cold, unleſs warm'd by the Sun, and we find not any Heat very manifeſt in the parts of the Earth which are not very Deep: Which gives occaſion to judge that what there is of Heat remarkable in the Earth, ought to be plac'd far therein.

It is not eaſy to comprehend the Qualities of theſe Vapours or Exhalations which mix with Mineral Waters and warm them. It ſeems not neceſſary that they ſhould be all Bituminous or Sulphurous, tho ſome are ſuch. At *Aix la Chapelle* are found Flowers of Sulphur rais'd upon the Walls of Hot Springs which are there; and in the Burning Fountain of *Dauphiné* is ſeen a Flame which Iſſues forth with the Water, and which probably was not Flame under the Earth, where it had not Air enough to burn, and ſcarcely the Water

ter which iſſues forth with it is heated. But in many other Springs of Hot Mineral Waters there is nothing ſeen either Sulphurous or Inflammable. There are many other Subſtances which are heated without taking Fire, the Vapours whereof mix with Hot Mineral Waters, but their Qualities are not underſtood but by the effects which they produce.

The Royal Academy of the Sciences has not had Opportunities to obſerve the divers Effects of Mineral Waters, as well Hot, as Tepid and Cold, by employing them to different Uſes. The Obſervations of the Effects of theſe Waters on Perſons who uſe them in Drinking, Bathing, Pumping, Waſhing, Embrocation, *&c.* are reſerv'd for the Phyſicians, whoſe Duty it is to know the Particular Conſtitutions of thoſe Perſons, and the State of their Health Declining or Improving. As for the Uſes in Mechanical Arts, it may be eaſy to remark what one or other ſorts of theſe Waters can do, in the ſteeping of Hemp, whitening of Linnen, dying of Wool and Silk, dreſſing of Leather,

tempering of Iron, boyling of Peaſe and ſuch like, watering of Plants, watering of Cattle, *&c.*

As for the Obſervations, concerning the different Weights and Conſiſtences of Mineral Waters, they may be better made on the Places of their Springs, where they are not yet alter'd, either in Compoſition or Conſiſtence; which they certainly are, being carried and kept, having loſt ſome part of thoſe Vaporous ſubſtances which being mixt with them, made their Conſiſtence more Thin and Subtil; or having contracted ſome Corruption which hath rendred them more Thick and almoſt Mucilaginous; or having made a Precipitation of ſome Mineral Earthineſs, which being imperceptibly mixt with them, renders them leſs Subtil, and which is not ordinarily ſeparated when they are drunk freſh, at which time they are judg'd more efficacious than when they are kept.

The Inſtruments us'd by the Academy to obſerve the Weight and Conſiſtence of Liquors, were the Araiometre and the Compound Balance.

The

The Araiometre is a little hollow Globe of Glaſs, having in its bottom a ſmall Cavity to contain ſo much Quick-ſilver as is neceſſary to make this Globe ſink in the Liquor wherein it may be put. In its upper part is a little Pipe an Inch long; and at the end of this Pipe there is a ſmall Scale to receive the adjuſted Weights, which cauſe it to ſink in different Liquors to a certain Mark made in the middle of this Pipe. By this Inſtrument put in ſeveral Liquors is found not onely whether their Conſiſtence be different, but alſo how much the Difference is, by the Obſervation of the Weight of the Inſtrument, and of that which is put in the Scale, to make it ſink equally in divers Liquors.

The Compound Balance is an ordinary Balance, moving eaſily, and very exact; to one of the Scales whereof is hung by ſome Horſe-hairs a Cylinder of Tin or Leton well poliſh'd, having about four Inches Height and as much Diametre, to be able to take up in the Water the ſpace which a Pint of Liquor of *Paris* Meaſure would take, and of ſuch a weight that it may ſink in all ſorts

of Waters. This Cylinder being put in the Water the Weight and Consistence whereof is to be observ'd, there is put in the other oppoſite Scale of the Balance ſo much weight as is neceſſary to keep the two Scales Equipois'd; and according to the difference of Weight, which is requiſite to keep this equal Poiſe in divers Waters, judgment may be made of the difference of their Conſiſtence and Weight in like Quantity. And to know what is the Weight of this Quantity of Water which the Cylinder takes up, the Weight put in the oppoſite Scale is to be ſubſtracted from that of the Cylinder. This may be practis'd on Mineral Waters taken at their Springs, and preſently examin'd.

The like Obſervations may be made on Common Waters, in ordinary Uſe, as well for drinking, as dreſſing of Victuals, to the end that by the knowledge of their Properties judgment may be made what they contribute towards Health. Theſe Waters, ordinarily call'd Common, in diſtinction from Mineral, being not altogether Pure and Simple, may have acquir'd divers Proprieties by

by the diverſity of Mixtures which in them are made, either in the Air or Earth. And altho they contain none of thoſe Species of Minerals which may be refer'd to the middle Mineral or Metallic Gender, the participation whereof gives the Name of Mineral to thoſe Waters which are impregnated therewith; nevertheleſs they have ſomething Mineral: for the Salts and Earths, which are always mixt with them, are Mineral Productions. And in the moſt part of the Waters ſent for Mineral, whereon the Obſervations made in the Royal Academy are here related, there was found only Salt and Earth in different Proportions. The diſtinction between the Waters of this ſort which are us'd only medicinally, and thoſe which are commonly made Uſe of in order to Aliment, depending only upon More or Leſs of theſe mixtures. The Common Waters, which are eſteem'd the beſt, are the moſt Subtil, Light, and leſs Mixt.

FINIS.

ADVERTISEMENT.

Martini Liſter, è S. R. *Lond.* de Fontibus Medicatis *Angliæ*, Exercitationes Duæ. *Londini.* 1684. in 8°.

THE Deſign of this Ingenious Author being to ſhew that in the ſeveral Mineral Waters of England, *whereon he had made Experiment, were found only two ſorts of Salts,* viz. *Common Salt, and a ſort of Nitre, call'd by him* Nitrum Calcarium; *and only two ſorts of Sediments,* viz. *Ocre and Chalk-ſtone; it may not be improper to mention this Book as confirming the Experiments of our* French Virtuoſi.

A

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